THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

At the moment the reported acquisition of Mr. Carnegie's stock in the Carnegie Co., which has been asserted with more positiveness in the past day or two, dominates all topics of mere market interest in the iron trade. We have reason to believe the report is correct, though there is no official announcement of the transaction at this writing. The week has been full of peace talk; and while there has been a vast amount of unwarranted apprehension over the outcome of plans which were construed to mean the precipitation of a desperate conflict in the steel trade, there is no disputing the fact that the developments of the past ten days have vastly improved the outlook for profit in steel manufacture. The announcement of the sale of Mr. Carnegie's holdings was preceded by the statement that the project for a tube mill at Conneaut, O., had been given up. This latter statement may be regarded as an inference from the personnel of the purchasers of Mr. Carnegie's holdings. With the latter in the hands of J. Pierpont Morgan and his associates, there is no likelihood that any move will be made that will impair the value of National Tube Co. securities. Whatever the details of the transactions now being concluded in New York, it may be said that the way is now open as it has not been since the consolidations came into the iron trade, for profitable operation of the plants of all. The tendencies in evidence for a number of weeks are still seen in the market—a difference in the conditions affecting pig iron and those affecting finished material. In the latter not only are prices well maintained, but there is an advancing tendency, with every indication that this condition will be emphasized when the season of active outdoor operations opens. It goes without saying that if such expectations are realized the pig iron trade will fall in line at length; but just now it is the laggard in the procession. More furnaces are going in blast at a time when others are considering the advisability of blowing out, because of the unprofitableness of operation at today's prices. The sifting process is going on and it may go to the length of reducing the effective blast furnace capacity quite below the level of current consumption. This would soon bring about the advance to which pig iron producers have been looking forward with more or less confidence for some months, without any signs of its immediate realization. Foundries are still buying sparingly, evidently in the belief that they will get lower prices later. Pipe works have continued their purchases with some freedom, the outlook in that trade being excellent. A 6,000-ton transaction in pipe iron is reported in the Chicago district. Conferences at New York this week by manufacturers of billets, rails and plates may result in advances in the first two, though sentiment is still divided. The structural mills are booking business in excess of their current shipments, and the promise of heavy contracts, particularly in New York and other Eastern points, is unusually good. Chicago reports several drainage canal bridge contracts closed the past week, with some large work in sight due to railroad track elevation.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Feb. 6.

In sales of both raw and finished material the past week has been exceedingly quiet, but despite the limited amount of new tonnage placed the best of feeling exists in the market generally. Sales of Bessemer iron amounted to about 5,000 tons at prices ranging from $12.75 to $13 at Valley furnace. The gradual increase in the coke output of the Connellsville region is an indication that idle furnaces are resuming and for the week ending Jan. 26 the output of the region passed the 200,000 ton mark. Within the next week or ten days three furnaces in the Valleys will resume operation, all going on Bessemer. The steel manufacturers will meet in New York this week for the purpose of discussing existing prices. There is a possibility that the price of rails will be advanced and there is considerable talk in favor of advancing the price of billets. In plates the amount of new business has fallen off considerably during the past month and there is not nearly as much talk about advancing prices as there was one month ago. The scarcity of steel billets for immediate delivery continues and several large producers here refuse to make the schedule quotations for long-distance shipments, insisting upon the Pittsburg price plus the actual freight. From 25 to 50 cents per ton advance continues to be paid for billets for immediate shipment and the market has suddenly become one of the strongest in the list. In finished products wire and nails are exceedingly firm, with an upward tendency. The cut nail manufacturers have advanced their price 5 cents a keg, following the initiative of the American Steel & Wire Co. last week.

A complete settlement of the labor difficulties at the Valley furnaces has been made, the men accepting the reduction of 10 cents as outlined in our report last week.

The zinc ore producers of the Missouri-Kansas district decided last week to shut down 75 per cent of their plants for at least a month. This action is due to the exceedingly low price of spelter which is at present quoted below 4c, Pittsburg. There will be but one result—an advance in price. Large consumers in this district have not covered their wants for more than a month, owing to the declining market of the past few months.

Much speculation is going on here among pig iron producers and steel manufacturers generally over the delay in fixing ore prices for next year. It appears that both the merchant furnacemen and the ore producers are playing a waiting game, the ore men waiting for better prices on pig iron so that they can fix a better price on ore, while the furnacemen it is claimed are not anxious for very much higher prices on iron just at present.

PIG IRON.—Sales of Bessemer iron amounted to 5,000 tons. One lot of 1,000 tons for prompt shipment was sold at $13 at the furnace while the remainder was sold at $12.75. There is no inquiry for large lots and it is the prevailing impression that February will see little buying except for immediate requirements. The blowing in of three idle furnaces in the Valleys within the next two weeks is an indication of the better feeling. These furnaces are the Hannah at Youngstown, one of the furnaces of the Republic Iron & Steel Co., the Claire furnace at Sharpsville, and the Alice. Both furnaces will be put on Bessemer. Despite rumors to the contrary the iron at a Mahoning Valley furnace now in the hands of executors still remains unsold and the estate refuses to entertain any offers to sell at ruling prices. There is little doing in foundry iron. Many are buying for immediate consumption and the majority of the foundrymen in this district have not placed their requirements for more than a month or six weeks ahead. We

note the sale of 1,000 tons at $14.25, delivered, Pittsburg. Forge iron shows no great strength. We note several small sales at $13.25 to $13.35, Pittsburg. Revised quotations are as follows:

Bessemer, Valley	$12.75 to $13.00
Bessemer, Pittsburg	13.50 to 13.75
No. 1 Foundry	14.50 to 15.00
No. 2 Foundry	14.00 to 14.25
No. 3 Foundry	13.50 to 14.00
Gray Forge, Pittsburg	13.25 to 13.35

STEEL.—One of the largest transactions of the week was the sale of 4,000 tons of open-hearth billets at $20.75, delivered Pittsburg. While producers are willing to sell at the Pittsburg price they are not looking for any business where they would be required to absorb any of the freight rate according to the schedule of prices now in effect. Several large producers are quoting billets for long distance shipment, the Pittsburg price plus the actual freight rate. Bessemer billets continue firm and for immediate shipment from 25 to 50 cents per ton additional is asked. The steel interests will meet in New York this week when it is probable that an advance will be made. Our quotations unchanged are as follows: 4x4 billets, delivered, Pittsburg, Wheeling or Valley at $19.75. On less than 4-inch billets down to 1½-inch $1 extra is charged. Open-hearth Billets are $1 per ton above Bessemer billets at all delivered points. Sheet and tin bars are $1 above Bessemer billets.

FERRO-MANGANESE.—The largest producer continues to quote $62.50 per ton for carload lots delivered at buyer's mill.

SPELTER.—The spelter market continues to decline and we quote prime western grades at 3.97½c, Pittsburg. Owing to souri-Kansas district last week decided to shut down their souri-ansas district last week decided to shut down their plants for at least a month. It is believed that by cutting off production they will be enabled to secure better prices. For the past year the price of spelter has gradually declined until it is as low as it was five years ago.

RAILS AND TRACK MATERIAL.—Demand for light rails for immediate delivery is very strong and the prices we quote below are being made for prompt shipment only. For future delivery these quotations are cut about $2 per ton. Track material continues in fair demand. We make the following quotations: Rails, standard sections, 50 pounds and over, in lots of 200 tons and over, $26; car lots and less than 200 tons, $28; less than car lots, $30; 8 to 12 pounds, $30; 16 to 20 pounds, $29; 25 to 40 pounds, $28. Track material: Spikes, 1.70c to 1.75c; track bolts, square heads, 2.25c; hexagon heads, 2.35c; fish plates, 1.40c to 1.50c.

BARS.—While producers in this district continue in full operation on running contracts new business is not very extensive. We have also been advised that while small lots command from 1.25c to 1.30c, a desirable order for a large tonnage could be placed at 1.20c. Iron bars are held at 1.35c delivered, Pittsburg, and refined bars at 1.75c.

PLATES.—A meeting of the plate manufacturers will be held in New York on Thursday, Feb. 7, for the purpose of considering present conditions. While the interests are not united in favor of an advance it can be stated that despite a slight falling off in new business there will under no conditions be a decline. We make the following quotations: Tank plate, ¼-inch thick, up to 100 inches in width, 1.40c at mill, Pittsburg; flange and boiler steel, 1.50c; marine, ordinary firebox, A. B. M. A. specifications, 1.60c; still bottom steel, 1.70c; locomotive firebox, not less than 1.90c; and it ranges in price to 3c. Plates more than 100 inches wide, 5 cents extra 100 pounds. Plates 3-16 of an inch in thickness, $1 extra; gauges Nos. 8 and 9, $2 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash in 30 days.

STRUCTURAL MATERIAL.—Little new business was placed during the past week but the outlook for a big spring demand is excellent. Our quotations unchanged are as follows: Beams and channels, 3 to 15 inches, 1.50c; 18 to 24 inches, 1.60c; tees, 1.55c; zees, 1.50c; angles, from 3 to 6 inches, 1.40c; universal mill plates, 1.40c.

MUCK BARS.—We note the sale of 3,000 tons of muck bar during the past week at $25.50 per ton.

SKELP.—Demand for skelp is fair. We quote both grooved and sheared iron skelp at 1.55c. Steel skelp is held at 1.35c.

PIPES AND TUBES.—The largest producer reports a continued demand for small lots for immediate shipment which is an indication that jobbers have not very large stocks on hand and that the spring demand will be large. Prices are unchanged. Discounts to consumers in carload lots, Pittsburg, are as follows:

MERCHANT PIPE.

	Black. per cent.	Gal'vd. per cent.
⅛ to ¾ inch and 11 to 12 inch	61	48
¾ to 10 inch	68½	56

BOILER TUBES.

	22 Feet and under. Per cent.		Over 22 Feet. Per cent.	
	Iron.	Steel.	Iron.	Steel.
1 to 1¾ and 2¾ to 5 inches, inclusive	49½	68½	44½	65
2 to 2½ inches, inclusive	45	63	39½	59
6 inches and larger	57	62	52½	58

CASING.

	S. and S., per cent.
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12½ inches	65

O. D. PIPE.

	Per cent.
14 to 22 inches	42
24 inches, o. d. and larger	37

THREADS AND COUPLINGS.

	Per cent.
14 to 16 inches, o. d.	35

MERCHANT STEEL.—Specifications on contracts for tire steel have been very numerous the past few weeks and some difficulty is being experienced in filling orders for immediate shipment. Our quotations are as follows: Shafting, carload lots, 55 per cent off, less than car lots, 50 off; tire steel in carload lots and over, 1.50c; less than carload lots, 1.55c to 1.60c. Toe calk is held at 1.50c to 1.60c in large lots, and in small lots as high as 1.70c. Tool steel is held at 7c and upwards according to quality. Hoops and bands, 2c to 2.10c.

WIRE NAILS.—The producers of cut nails advanced the price of their product this week 5 cents a keg, following the lead taken by the American Steel & Wire Co. of last week. Demand for all kinds of wire and nails is strong and prices have an upward tendency. We revise quotations as follows: Single carloads of wire nails to jobbers, $2.30 Pittsburg; to retailers, $2.40. Plain wire, carload lots, is now quoted $2.25 to jobbers and $2.35 to retailers; painted barb wire, $2.60, in carload lots to jobbers, and $2.70 to retailers; galvanized barb wire, $2.90 in carload lots to jobbers and $3.00 to retailers. Cut nails are still quoted at $2.00 Pittsburg in carload lots, 2 per cent off in 10 days.

OLD MATERIAL.—The market continues quiet, consumers buying for immediate consumption only. We revise quotations, gross tons as follows: Heavy melting stock, $14.50; iron rails, $19; busheling, $14.25; cast borings, $6.75c; turnings, $10.50; car wheels, $17; No. 1 wrought, $17; low phosphorus melting stock, $18; horse shoes, $15.50.

SHEETS.—Demand for sheets continues strong and there is considerable buying for future delivery. We make the following quotations: Black sheets, No. 28 guage, one pass through cold rolls, 2.95c to 3c; No. 27, 2.85c to 2.90c; No. 26, 2.70c; No. 24, 2.60c; No. 22, 2.50c: No. 20, 2.40c; No. 18, blue annealed, 2.15c to 2.20c; No. 14, 1.90c to 2c; Nos. 11 and 12, 1.75c to 1.85c; No. 10, 1.65c to 1.70c; plates, gauges, 8 and 9, 1.55c to 1.60c. Galvanized sheets continue to be held at 75 and 75 and 10 and 5 off with no freight allowance.

COKE.—Negotiations are still pending looking toward an agreement among the leading coke producers, although there is little probabiltiy of it being carried through. Prices are no better and there is little buying. We quote strictly Connellsville furnace coke at $1.75 and foundry at $2.25. Non-Connellsville furnace coke is held at $1.60 and foundry at $1.90 to $2. For the week ending Saturday, Jan. 26, the coke production of the Connellsville region passed the 200,000 ton mark, the total estimated production being 201,167 tons. This was an increase of 2,793 tons over the previous week. Of the 20,997 urnaces in the region, 17,491 were active and 3,506 idle. The production of the region is fast reaching the high mark during the boom period and new ovens are weekly being put into blast. Shipments for last week aggregated 10,138 cars, an increase of 758 cars compared with the previous week.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1522 MONADNOCK BLOCK, Feb. 5

The month opened with very little change in the situation in this market. The demand for most classes of material

has been limited to comparatively small lots in the week, but there is somewhat of an increase in the number of inquiries over the week previous. In some lines a large inquiry is had, and sales have been about as good as the mills could take care of. This is particularly true of materials entering into car construction and railroad work. An independent pipe works has purchased 6,000 tons of law grade irons from Southern furnaces.

PIG IRON.—Aside from the sale of 6,000 tons of iron to a pipe works mentioned above, no large orders have been closed. The demand at the first of the present week shows some little improvement, however, in the fact that the number of buyers in the market is increased. None is asking for quotations on any heavy tonnage, however, and it is not expected that the immediate future will show any important orders or any great gain in tonnage. The local furnaces report order books well filled for the next five or six months, and that they are content to take what business is offered without pushing to increase it. Some of the Southern furnaces are in about as good condition, but others are after business, and instances are to be found where concessions have been made to secure it. It is a difficult market to quote accurately, but the figures we give fairly represent the going prices on small lots. There is little doubt that a large buyer could secure lower prices than these from some sellers, if not from all. Quotations are as follows:

Lake Sup. Charcoal	$18 50 to $19 50	Southern Coke No. 4	$13 35 to $13 85
Local Coke Fdy. No. 1	15 50 to 16 00	Southern No. 1 Soft	14 85 to 15 35
Local Coke Fdy. No. 2	14 50 to 15 00	Southern No. 2 Soft	14 35 to 14 85
Local Coke Fdy. No. 3	14 00 to 14 50	Southern Silveries	15 50 to 16 00
Local Scotch Fdy. No. 1	15 50 to 16 00	Jackson Co. Silveries	17 50 to 18 50
Local Scotch Fdy. No. 2	14 50 to 15 00	Ohio Strong Softeners	15 75 to 16 25
Local Scotch Fdy. No. 3	14 00 to 14 50	Alabama Car Wheel	21 00 to 22 00
Southern Coke No. 1	14 85 to 15 35	Malleable Bessemer	15 00 to 15 50
Southern Coke No. 2	14 35 to 14 60	Coke Bessemer	15 00 to 15 50
Southern Coke No. 3	13 85 to 14 35		

BARS.—The demand is especially good for car work, and some very good contracts for both steel and iron were closed in the week. The steel mills report having little tonnage to sell, and that they have turned away business in the past few days. Steel bars are very firm at 1.45c to 1.50c, half-extras, Chicago. Iron mills are pushing harder for business, and in some cases have made concessions from the quoted prices of 1.45c to 1.50c, half extras.

STRUCTURAL MATERIAL.—With the exception of some small orders for stock from local builders, little business was done. The demand seems to very limited, and mills do not expect any immediate increase, although they are looking for a considerable tonnage to be placed later in the season. Quotations are unchanged as follows: Beams, 15 inches and under, 1.65c; 18 inches and over, 1.75c; angles under three inches, 1.40c to 1.45c; over six inches, 1.65c; three inches to six inches, 1.55c; plates, 1.55c; tees, 1.70c; zees, 1.65c; small lots from store are quoted ¼c to ½c higher.

Later.—Contracts for three bridges were let last week by the Drainage Canal trustees, involving about 1,200 tons of shapes and several hundred tons of castings, for counterweights, etc. Other canal contracts will be let later in the season. It is expected, too, that the city of Chicago will let contracts for quite a little bridge work this year. The city council has before it ordinances for a great deal of track elevation, involving the C. & N. W., the C. M. & St. P. and the Pennsylvania roads, and it is expected that they will be accepted by the roads concerned and that a good deal of the work will be done in the coming season.

RAILS AND TRACK SUPPLIES.—The week was quiet, with only a fair amount of orders closed for standard sections. Light sections are in good demand and sales in the week covered a good tonnage. Quotations are as follows: Rails, standard sections, $26; light sections, $25 to $28; splice bars, 1.40c to 1.50c; spikes, 1.70c to 1.75c; track bolts, hexagon nuts, 2.60c to 2.65c; square nuts, 2.40c to 2.50c.

PLATES.—The demand is good, and sales last week were quite large. Most of the business was from store, as the mills are well sold ahead, and can take little businee for quick delivery. Car works are good buyers, and their purchases in the week included several round lots for future delivery. Prices are made as follows, mill shipment, Chicago delivery: Tank steeel, 1.55c; flange steel, 1.65c; marine steel, 1.75c; fire-box steel, ordinary, 1.75c; fire-box, special, 2.25c and upwards.

BILLETS AND RODS.—Quotations are unchanged at $20.75 for Bessemer billets, and no large orders closed.

SHEETS.—The demand continues excellent, and sales last week were fully up to those of any previous week for some time past. Mills are very busy working on specifications on old orders. No. 27 black sheets are quoted at 3.15c, Chicago, for mill shipment, and galvanized at 70 and 7½ per cent discount.

MERCHANT STEEL.—Sales have been limited to small lots for filling in, and not much business is expected to be closed right away, as this is apt to be a dull season. Buyers are taking their steel on old contracts about as rapidly as the mills can get it to them. Quotations are as follows, mill shipments, Chicago delivery: Smooth-finished tire steel, 1.75c to 1.85c; open-hearth spring steel, 2.15c to 2.35c; toe calk, 2.40c to 2.55c; sleigh shoe, 1.70c to 1.80c; cutter shoe, 2.40c to 2.55c; ordinary tool steel, 6c to 7c; specials, 13c and upwards.

MERCHANT PIPE.—There is a fair demand for small lots, and one or two quite good sized sales have been closed. The market is firm and unchanged. Prices are as follows, for random lengths, Chicago delivery:

MERCHANT PIPE.

	Carload lots. Black Per cent.	Carload lots. Galv. Per cent.	Less than carload lots Black Per cent.	Less than carload lots Galv. Per cent.
⅛ to ¼ and 11 to 12 in	59.2	46.2	54.9	40.9
¾ to 10 inches	66.7	53.3	61.9	49.9

WIRE AND WIRE NAILS.—The sales of the week were very large, and indications for the future are that business will be fully as good for some time, and may increase with the early spring months. Mills are very busy on old orders, and in some cases find it difficult to keep up with their contracts. Makers quote the following prices: Single carloads of wire nails to jobbers, $2.40, Chicago; to retailers, $2.50; plain wire, carloads, to jobbers, $2.35, to retailers, $2.45; painted barb wire, to jobbers, carloads, $2.70; to retailers, $2.80; galvanized barb wire, carloads, to jobbers, $3; to retailers, $3.10.

OLD MATERIAL.—There is only a fair demand for any class of old material, and dealers report a light business in the past week. Some of the dealers are somewhat pessimistic as to the future, and look for much lower prices than now prevail. Others, however, say that they expect business to be much better within a short time, as soon as general buying is improved. The outlook for the immediate future is not especially encouraging. Dealers' selling prices are as follows, per gross ton:

Old iron rails	$18 50 to $19 00	Old wheels	16 00 to 17 00
Old steel rails, long	15 00	Heavy melting steel	10 50 to 11 00
Old steel rails, mixed	11 00 to 12 00	Mixed country steel	9 50 to 10 00
Relaying rails	20 00 to 22 00		

The following are selling prices per net ton:

No. 1 R. R. wrought	14 50 to 15 00	Cast borings	3 00 to 3 50
Dealer's forge	12 50 to 13 00	Wrought turnings	7 25 to 7 50
No. 1 cut mill	9 75 to 10 00	Iron axle turnings	9 00 to 9 50
Heavy cast	11 50 to 12 00	Steel axle turnings	8 00 to 8 50
Railway malleable	11 50 to 12 00	Stove plates	7 50 to 8 00
Country malleable	9 75 to 10 00	Old iron splice bars	16 00 to 16 50
Iron axles	18 00 to 19 00		

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
CAXTON BUILDING, Feb. 6.

Beyond getting together their statistics for 1900 and their estimates of the possibilities of various properties for 1901, the ore interests have taken no steps toward definite action on the basis of prices for the coming year. The large producing-consuming interests are proceeding on the belief that a large business will be done this year, but there is full recognition of the fact that if the foreign trade is to be held, in this year of falling demand and prices abroad, no help but rather harm will come from an effort to hold ore to any approximation to the prices of 1900. Not all the exporters of finished material have their own complete ore supplies; and in any event high ores mean high labor, high rail freights—a high level of cost even to the steel company running its own mines.

PIG IRON.—Bessemer iron was sold last week at $12.75 valley furnace, and this week small transactions are reported at $13 at furnace or 50 cents above the level of the large contracts of January. Several idle furnaces are getting into shape for resumption and the situation has a much more favorable look. Yet to occupy all the merchant furnaces up to July 1 there must still be considerable purchases of Bessemer iron for delivery in the first half. Reasoning from conditions in the steel trade the consumption of Bessemer iron is now heavier than in months, manufacturers of billets having been able to

secure an advance over the pool price, which at the time it was fixed seemed high. Foundry iron is still quiet, and buyers have not changed their mood. It is likely that concessions on quoted prices could be had if large lots were taken but there are no large-lot buyers just now. It would be fair to quote No. 2 foundry at $13.25 at valley furnace, though some sellers ask $13.50, and it is intimated that $13 has been done. Forge iron is inactive at $12.50 in the valley. Cleveland quotations follow:

Bessemer	$13 50 to $13 75	Valley Scotch No. 1	$14 50 to $14 75
No. 1 Strong F'dry	14 50 to 14 75	Valley Scotch No. 2	14 00 to 14 25
No. 2 Strong F'dry	14 00 to 14 25	Gray forge, valley	13 50
No. 3 Foundry	13 50 to 14 00	LakeSuperior charc'l	17 00 to 17 50

FINISHED MATERIAL.—New orders are only of moderate volume, but the feeling is one of strength, with the season of outdoor operations only six weeks ahead. We have referred recently to some pressure for business in bar iron by one or two individual mills. The large producers, however, are well filled and running to the extent of their capacity. The quotation 1.30c is maintained by valley mills on current new business, which is confined to small or moderate lots. Steel bars are quoted 1.25c at valley mill, but on Eastern shipments the 1.25c Pittsburg basis is met. One or two interests that have been higher than others on steel bars are now on the 1.25c basis, Pittsburg mill, and it is intimated this can be shaded slightly. Structural material is quiet, locally, but it is understood that the mills are booking a somewhat larger tonnage than they are shipping week by week, and have assurances of large contracts ahead, which are now being figured on. In the local market an inquiry came up the past week for 30,000 tons of shapes and plates, presumably for some large Eastern work that is expected to come up. The sheet market is firm at 2.95c to 3c Pittsburg for No. 28, one pass through cold rolls. For No. 10 blue annealed, 1.75c is quoted and for No. 12, 1.85c; one pass through cold rolls, 2.20c. There is little new business in plates, though vessel projects are still coming to the front. One or two plate mills whose condition is most congested have found outside mills in position to take some of their orders and make fairly prompt deliveries.

CINCINNATI.

Feb. 5.

Matthew Addy & Co. say in their pig-iron report this week: "Unquestionably the market has a better tone. The improvement began with the purchases of Bessemer which inspired more confidence in buyers than they had before possessed. The result has been a much active demand and considerable purchasing. Not only are the small buyers decidedly in evidence, but a number of large lots have been bought, and as we write several wholesale blocks are under consideration. The requests for faster shipments on old orders are as pressing as ever. Melters of iron throughout the country are busy and there is a revival of trade in many directions that is conspicuous, notably in cast iron pipe. It is an undisputed fact that all branches are busy and that the prospects ahead for an increase in activity are excellent. Iron masters both North and South are complaining that prices have been forced down now to a point where the margin of profit is too small for safety. There are still buyers of Southern iron who seem to feel that at present prices the Alabama and Tennessee iron masters have a bonanza. Could they see the cost sheets of the Southern iron companies they would speedily realize their mistake. Costs in the South advance precisely in the same ratio as costs in the North. Under these circumstances lower prices than those prevailing are not at all probable. In fact, the present active buying indicates firmer views on the part of sellers all around. All the recent developments are full of encouragement and we look for a continuance of buying that will put the iron masters in an increasingly better position."

We quote as follows from the comment of Rogers, Brown & Co.: "Quite a lively demand for pig iron has been experienced during the past week, but the anxiety of sellers has resulted in a number of instances in special prices being made, and the market can be termed decidedly irregular. While prices of finished material are firm, and in some instances advances are indicated, the prices of raw material are unsettled in face of increasing consumption. Inquiries have been received for long scattered delivery, but as a rule consumers seem content to cover their nearby requirements, thinking that if an advance takes place it will be general, and they can get more for their product, while if prices are to further decline, they naturally wish to get the benefit. If the question of cost was to be taken into consideration during the next few months, there would be no fear of a decline, but unfortunately for makers of iron, the market goes its own way irrespective of whether producers are making or losing, until the decline is arrested by a sharp reduction in the number of active furnaces:

We quote for cash f. o. b. cars Cincinnati: Southern coke, No. 1 foundry, $14 to $14.25; No. 2 foundry, $13.25 to $13.75; No. 3 foundry, $12.75 to $13.25; No. 4 foundry, $12.25 to $12.50; gray forge, $12 to $12.25; No. 1 soft, $14 to $14.25; No. 2 soft, $13.25 to $13.75; Lake Superior coke, No. 1, $15.25 to $15.50; Lake Superior coke, No. 2, $14.25 to $14.50; Hanging Rock charcoal, No. 1, $19.50 to $20.00; Jackson Co., Silvery, No. 1, $17 to $17.25; Standard Georgia car wheel, $18.75 to $19.50; Lake Superior charcoal, $19 to $20.

PHILADELPHIA.

Feb. 5.

The situation is not yet sufficiently settled to determine the immediate future with any amount of certainty, but the balance seems to rest well on the favorable side. Now that the lower freight rates have gone into effect, the atmosphere may become clearer. However, the many rumors in regard to the plans of the large companies cannot have any but a disquieting effect on the market. Consumption continues heavy and deliveries average well up to output. Bessemer iron is stronger and has advanced 50 cents, because of the recent heavy buying at Pittsburg by several of the larger companies. Foundry and mill irons are somewhat weak, and sales have been made at lower prices than those current in the greater part of January. Billets remain steady, with a fair demand. Rumors are still current of an advance in rails, as well as in plates and billets, but action on all is deferred. A conference is likely about the middle of the month. Some little export business is being done, but producers are depending almost entirely on the home market.

PIG IRON.—Dullness characterizes the market and buying is spasmodic. A number of large sales for nearby delivery have been made, but all for prices below quoted figures. One sale of 10,000 tons of No. 1 x foundry, and others of 2,000 to 3,000 tons each of No. 2 x foundry, and some sales of 3,000 to 7,000 tons each of low grade irons are reported. Sellers have lost some of their apathy and are making more of an effort to place sales, evincing some willingness to accept lower figures. Purchases are a little slow in placing orders, holding off for concessions. However, stocks in consumers' yards are small, and there are few long-time contracts in existence. Nominal quotations remain the same, except for gray forge, which is 25 to 50 cents lower. We quote: No. 1 x foundry, $16 to $16.50; No. 2 x foundry, $15.50 to $16; No. 2 plain, $14.75 to $15.25; gray forge, standard brand, $14.25 to $14.50.

FINISHED MATERIAL.—Demand has fallen off somewhat, especially in bars, but mills are still comfortably full. Plates are strong and a great deal of business is in sight. Sheets are very active and mills are filled to almost their fullest capacity, and further advances in price may be made. Quotations are as follows: Best refined iron bars, 1.40c to 1.50c; steel bars, 1.40c to 1.50c; plates ¼-inch and thicker, 1.55c to 1.60c; beams and channels, 1.65c to 1.75c; sheets, mill shipments, one pass through cold rolls, No. 10, 2.05c; No. 14, 2.25c; No. 16, 2.45c; Nos. 18-20, 2.95c; No. 24, 3.05c; No. 26, 3.10c; No. 28, 3.25c to 3.30c.

OLD MATERIAL.—Steel scrap is in good demand, and is strong at quoted figures. We quote the market as follows: Choice railroad scrap, $18 to $18.50; No. 1 yard scrap, ordinary, $14 to $15; No. 2 light scrap, $12.50 to $13.50; machinery cast, $14.50 to $15; heavy steel scrap, $15 to $16; old iron rails, $18 to $19; old steel rails, $15.50 to $16; wrought turnings, $10.50 to $11.50; cast borings, $8 to $8.50, old car wheels, $17.50 to $18.

BIRMINGHAM, ALA.

Feb. 4.

The local iron situation remains unchanged with quotations the same as a month ago. It has been reported that con-

cessions of from 25 cents to 50 cents are made by some of the companies on offerings for immediate delivery, but inquiry among the officials of the local iron manufacturing companies fails to confirm these statements. Prices authorized by local companies are based on $11 for No. 2 foundry, although it is stated that on offers for any considerable tonnage this figure might be shaded about 25 cents, and competitors in some other districts have named $10.50. The local market is in a fairly healthful condition with buyers covering their wants for the next sixty days. There is practically no export business, the prices on the other side of the Atlantic and the freight charges operating, to keep Alabama iron out of those markets. Deliveries on orders booked for export last summer and fall are being made and these will continue for several weeks yet, but practically no new business is being secured. The local manufacturers speak hopefully of the outlook for business next spring and summer, but there is not that buoyancy that was noticeable a few weeks ago. The make of the furnaces is being sold, but mostly in small lots.

There has been much speculation the past week or two as to the probable changes to be made in the Tennessee Coal, Iron & Railroad Co. The action of the directors in abolishing the office of second vice-president two weeks ago came in the nature of a surprise, but since that various rumors have been circulated involving other officials of the company. A general shake-up in the company is anticipated after the annual meeting ,which will be held in March. Chairman D. H. Bacon of the executive committee has been in Birmingham the past week looking into the business affairs of the company, but he has given no intimation as to any probable changes. When asked by *The Iron Trade Review* correspondent if any other changes than that already announced were contemplated he replied that he could not say what would be done. He was not certain that any changes would be made. Mr. Bacon will remain in Birmingham about a week longer and then return to New York.

The Little Belle furnace of the Tennessee Coal, Iron & Railroad Co. at Bessemer is being relined. It was banked several days ago for this purpose.

The Alabama Consolidated Coal & Iron Co. announces that the Gadsden furnace will be started up on Feb. 9.

The Jenifer Furnace Co. has purchased the property of the Piedmont, Ala., furnace and will remove the equipment of that plant to Jenifer and add it to the present furnace at that place.

The foundries in Birmingham report good trade. All the foundry and machine shops in the city are running on full time and have business on their books that will keep them busy several weeks. The Hardie-Tynes Foundry & Machine Co. will rebuilt the plant which was recently destroyed by fire.

W. J. B.

Personal.

F. M. Jackson, general manager of the Alabama Consolidated Coal & Iron Co., has resigned his position and the office has been abolished. President T. G. Bush will have entire charge of the affairs of the company.

John Molamphy, master of transportation and labor of the Homestead Steel Works of the Carnegie Steel Co., has had $150,000 worth of the stock of the company set aside for him to be paid for out of the dividends.

S. V. Huber, of Pittsburg, mechanical engineer, and consulting engineer of the Youngstown Iron, Sheet & Tube Co., returned this week from England, where he investigated the Perrin process of manufacturing tubing.

The Warwick Iron & Steel Co. o Pottstown, Pa., in its annual report shows profits from pig iron sales in 1900 of $152,550.35. The dividends of the year were $95,000 and the surplus Dec. 31, 1900, was $151,998.55. The capital stock is $1,500,000, of which $1,384,710 is full paid. The amount above $1,000,000 is on new furnace account, $500,000 having been authorized for that purpose. Payments on the new furnace thus far amount to $299,668.92. The average price of iron shipped in the first six months of 1900 was $19.47; in the second six months the average fell to $16.08. The product for 1900 was 53,786 tons, a falling off from 1898 and 1899, due to the increased wear on the furnace lining and the fact that a larger per cent of foundry iron was made than in any previous year of the present blast.

MOLDERS AND FOUNDERS TO CONFER.

An appoint ment has been made for one of the most important conferences in the history of the relations between the Iron Molders' Union and the National Founders' Association. It will be held in Cleveland this week, beginning Thursday, Feb. 7. The correspondence which resulted in this appointment is as follows:

CINCINNATI, Jan. 19, 1901.

Mr. H. W. Hoyt, President National Founders' Association, Chicago, Ill.

Dear Sir:—Agreeable to an understanding which we reached by former correspondence, I submitted the suggestion of holding a joint conference of representatives of the N. F. A. and the I. M. U. of N. A. to the members of the executive board. Out of consideration of the fact that representative men of both associations appear to regret that there is such serious disagreement between them on matters affecting our mutual interests and agree that a joint conference at this time might result in a better understanding, the executive board of the Iron Molders Union, being desirous of promoting the friendliest relations and of consummating a better understanding between the two associations, authorizes me to arrange with you, if agreeable to the officers of your association, for the holding of a joint conference for the purpose of considering any matters which affect the relations of the two associations, including the resolutions which were before the joint conference of the two associations on June 14th and 15th, 1900. I would suggest that the conference be composed of five representatives of each side, and that it be held in the city of Cincinnati or in Cleveland, Ohio, on Thursday, February 7th, or such other dates as may be mutually agreeable. Trusting to be favored with your views upon this matter at an early date, and with best wishes, I am

Yours very truly,

MARTIN FOX,
President.

To this the following reply was sent by President Hoyt:

CHICAGO, Jan. 26, 1901.

Mr. Martin Fox, President Iron Molders' Union of North America, Cincinnati, O.

My Dear Sir:—In further reply to your favor of Jan. 19th, relating to Detroit conference of representatives of N. F. A. and the I. M. U. of N. A. permit me to say that it is the unanimous decision of the administrative council of the N. F. A. to accept your proposition for a conference between the N. F. A. and the I. M. U. of N. A. for the purpose of considering any matters that affect the relations of the two associations, and especially the resolutions which were before the joint conference of the two associations on June 14th and 15th, 1900. I am also pleased to accept your suggestion that the conference be composed of five representatives from each side and that it be held in the city of Cleveland, O., on Thursday, February 7th. Trusting that at the said conference harmonious relations will be re-established between the two associations which we have the honor to represent, I beg to remain,

Very truly yours,

H. W. HOYT,
President N. F. A.

The administrative council of the National Founders' Association, which consists of eighteen members, held a meeting for preliminary conference, at the Hollenden Hotel, beginning Tuesday, February 5. President Hoyt presided and most of the members of the council were in attendance. While reference is made in the letters of Presidents Fox and Hoyt to the resolutions discussed at the Detroit conference in June, 1900, it goes without saying that the Cleveland strike will have the attention of the ten conferees and that efforts will be made to end it. The five representatives from each side will be in frequent conferences in the intervals between the joint meetings, with the executive officers of their respective organizations. The executive board of the Iron Molders' Union consists of nine members.

In a special announcement of its East India plumbago, the S. Obermayer Co., of Cincinnati, falls into meter to say that "This is the blacking that made the castings, that started the engines, that turned the screws, that sped the ship on her famous trip, without a jar, or break or slip—the marvelous record-breaking run of our navy's pride, the Oregon."

THE IRON TRADE REVIEW

AND

INDUSTRIAL WORLD.

DEVOTED TO MACHINERY METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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FEBRUARY 7, 1901.

AN IMPROVED OUTLOOK.

The precise nature of the transactions on foot in New York in the past two weeks affecting important interests in the iron trade is not yet available for publication, but it may be said that the results are such as to improve distinctly the outlook for profit in the iron trade in 1901. That Mr. Carnegie has been willing to dispose of his interests may be inferred from the fact that a similar plan for the acquisition of his holdings was all but successful in 1899. Since that time the Carnegie company has been changed from a partnership to a corporation, and thus the transfer believed to have been arranged for in New York this week would be more easily made than when the Moore-Frick project was under negotiation.

We have not entertained the fears expressed in some quarters, of a disastrous war of competition, even were the plans announced by the Carnegie Steel Co. a short time ago carried out. But there is no mistaking the depressing influence the discussion of this project has exerted. This is now dissipated. Whatever the method adopted for the harmonizing of interests, it is now demonstrated beyond questioning that the vast capital represented in the iron trade consolidations will be operated for profit and not for war. At no time since 1899 has the outlook for profit in steel manufacture been so promising as it is today.

GROWTH IN FOUNDRY OPERATIONS.

In our issue of last week we showed, by dividing the figures for pig iron production in 1900, that while the output of Bessemer iron had decreased, that of basic and of foundry and forge irons had increased over the records for 1899, being 4,773,414 tons, or 340,522 tons more for 1899. Reasoning from the statistics of stocks and from the long shut-downs of the mills in the summer, we concluded that this increased production of foundry iron was accompanied by an increased consumption—this in spite of the much higher prices for castings than in 1899. This estimate receives independent confirmation from the statistics of foundries in operation as gathered by the *Foundry*. That journal says:

> From reports at hand we learn that 168 foundries changed hands last year, the total number of plants making iron and steel castings being now 4,419, an increase of 274 during the year, or a little over 15 per cent. Taking these figures into consideration, the foundry trade appears to be holding its own. Of course, this increased number of shops does not in any way indicate the increase in foundry capacity, for it is well known that older plants in great numbers erected large additions during the 12 months just closed.

It has been the common estimate in recent years that there were in the United States about 4,000 foundries. The careful canvass of our contemporary shows that the number has now reached 4,419. While there has been a noteworthy development in steel, the statistics and the known facts concerning new construction indicate a very important addition to our capacity for the production of gray iron castings. The cast iron pipe trade had not so good a year in 1900 as in 1899, so that there is no occasion for looking in that direction for any of the increase in the volume of castings for 1900 over 1899. The fact appears to be that cast iron is asserting its vitality in a surprising way, in spite of some of the sweeping predictions of its waning prestige. It is entirely reasonable to suppose, moreover, that the manner in which iron castings have held their place is due in no slight measure to the efforts put forth in recent years for the more intelligent operation of the foundry and the attainment of greater certainty in results with cast iron. Important as are organizations for the handling of foundry wage questions, those whose object is purely that of advancement on technical lines are proving of incalculable value in their meetings and their literature, and the stimulus they give to the development of the best possibilities of cupola iron.

CONDITIONS GOVERNING IRON EXPORTS.

The conditions controlling the problem presented by our export trade in iron and steel products do not seem to be as fully understood as they should be, judging from much that has been written in the last two or three years. There has been a tendency to regard the volume of our exports as dependent almost wholly on relative costs of production in different countries, freight rates and ship room. A commerce covering the whole world is subject to conditions which do not exist in domestic trade. In our trade within the United States for years back the purchase of a thousand tons of billets or other crude product has been what may be termed a matter of routine, quickly accomplished through the medium of the telegraph or telephone, and involving practically nothing but price, freight and time of delivery. With international trade, even in the cruder iron and steel forms, it is entirely different. Various prejudices must be overcome, the responsibility of the seller must be established and that of the buyer ascertained, perhaps with difficulty: quality must be established, banking facilities arranged for, and a vast number of matters must be looked after which are not presented in the domestic trade This all requires the expenditure of time and money, which cannot be charged against a single shipment or a year's business, but must be divided over a considerable period yet in the future.

We have no reason, therefore, to look for variations in the quantity of our exports in different lines con-

trolled from year to year only by relative costs of production, ordinary market prices and freight rates. These influences are felt only along with many others, and show themselves more in crude materials than in highly finished products. And even in cruder materials we may cite the experience with tin plate bars last year. American manufacturers undersold the South Wales market for tin plate bars, then very high, by about $5 a ton. The local open-hearth steel makers had been taking the scrap from the tin plate works at a certain figure, but seeing their product supplanted, they indirectly cast a slur on the quality of American steel by claiming the scrap produced from it was so poor that they could pay but half for it, and finally refused it entirely ,and many Welsh tin plate manufacturers became seriously prejudiced against American tin plate bars, although there is no doubt the quality was all that could be required. It would be very unfair to hold that all buyers of American iron and steel products can be as readily prejudiced, since the Welsh tin plate manufacturers have been notoriously prone to hold beliefs unsupported by plain facts or reasonable inferences. For example, they held that our climate would prevent the successful manufacture of tin plate.

When the character of the problem presented in building up a foreign trade is understood, our steady and rapid growth in iron and steel exports takes on an importance which it would not otherwise have, since neither as compared with British exports nor as compared with our total production have our exports reached very great proportions. Our exports of such iron and steel products as are returned by weight have never reached one-third of the British exports of the same class, while British exports of machinery and steam engines alone reached in 1900 the value of $95,360,767, against a value for our total exports of iron and steel and manufactures thereof of only $35,000,000 greater, or $129,633,480. The following table shows the total value of our exports of iron and steel and manufactures thereof, not including agricultural machinery, since 1871:

1871	$ 14 185 359	1881	$ 18 216 121	1891	$ 30 736 507
1872	12 595 539	1882	22 348 834	1892	27 900 862
1873	14 173 772	1883	22 716 040	1893	30 159 363
1874	17 312 239	1884	19 290 895	1894	29 943 729
1875	17 976 833	1885	16 622 511	1895	35 062 838
1876	13 641 724	1886	14 865 087	1896	48 670 218
1877	18 549 922	1887	16 235 922	1897	62 737 250
1878	15 101 899	1888	19 578 489	1898	82 771 550
1879	14 223 646	1889	23 712 814	1899	105 690 047
1880	15 156 703	1890	27 000 134	1900	129 633 480

The expansion now going on may be said to have started in 1895, since before that year there had been retrogressions following advances, and it is only since then that the figures have assumed considerable importance. The character has also changed very much, since the earlier exports were made up more largely of such lines as sewing machines, hardware, saws and tools, etc., and less of rolled iron and steel. In 1894 we exported more than twice as much wire as steel rails, the figures being 26,512 tons and 12,220 tons, respectively, while in 1900 steel rail exports were more than four times the wire exports, the figures having grown to 356,245 tons and 78,014 tons, respectively.

In the table below is presented a showing for three years by title of the exports of all lines in which the weight is given in the Treasury statistics, all being reduced to long tons for summation purposes.

The classification adopted long ago by the Treasury Department does not suit present conditions, nor is it such as would be formulated by one in the trade. We question whether the "iron rails" tabulated are not really old iron rails. Tin plate bars appear to a custom house official as very similar to certain sizes of merchant steel bars, and are presumably so classified, but the trade would prefer to see them grouped with billets, or given a separate heading. Under "iron sheets and plates" and "steel sheets and plates," the great bulk of the tonnage is plates and not sheets, but

IRON AND STEEL EXPORTS FROM UNITED STATES—GROSS TONS.

	1898.	1899.	1900
Ferro-manganese	3,700	13	32
Pig iron	249,357	288,665	286,783
Billets, ingots, etc	28,600	25,487	107,476
Iron rails	8,311	6,442	5,374
Steel rails	293,592	271,272	356,245
Structural shapes	34,038	54,344	67,714
Bar iron	7,074	10 898	13,285
Steel bars or rods, except wire rods	24,805	30 429	81,366
Wire rods	18,509	16 991	10,651
Wire	74,666	116,317	78,014
Wire nails	13,714	33,537	27,404
Cut nails	15,735	9,974	11,163
Tacks, etc	2,636	2,076	1,140
Hoops, bands, etc	1,593	2,869	3,021
Iron sheets and plates	4,466	6,196	9,331
Steel sheets and plates	27,074	50,635	45,553
Tin plates	40	133	273
Scrap	73,843	76,633	49,283
Total	881,761	942,792	1,154,108

we have reason to believe the tonnage of sheets is at least greater than of tin plates, which have had a separate heading since December, 1897, so that a separation of sheets and plates would be well.

In view of the close approximation of our pig iron production in 1900 (which alone has been ascertained) to that of 1899, it seems fair to assume that the total production of rolled iron and steel in 1900 was about 10,000,000 tons. The figures are susceptible of only a rough comparison, but indicate that we exported about 8 per cent of our rolled products, while pig iron exports constituted 2.08 per cent of the total production. This latter is disapponting, since it was expected a few years ago that Alabama pig iron would shortly become one of our most important export lines.

The important increases in billets, steel bars, structural material and steel plates represent a natural growth and the building up of a trade which is not likely to be very seriously interfered with in the future by declining values in foreign markets. Structural material, in particular, has entered foreign markets because it has gone mainly in the form of bridge and viaduct contracts, where American resourcefulness in design and promptness in execution forced the way. The vast amount of information regarding markets, local needs, methods of doing business, etc., now being collected by foreign representatives of individual manufacturers and by the various exporting concerns and bureaus of information will replace the stimulus, recently partly withdrawn, of much higher prices abroad than at home, and American iron and steel exports may reasonably be expected to continue their steady growth until they form a much larger percentage of our total production than they have heretofore.

Blair Station on the Monongahela river near Pittsburg has been chosen by the Crucible Steel Co. of America as a site for the location of its open-hearth plants, which are to be built as the property of the St. Clair Steel Co. Ten furnaces will be located here and it is altogether probable that all of the open-hearth furnaces of the company now distributed among the various plants will be concentrated here.

It is reported that the Lackawanna Iron & Steel Co., of Scranton, Pa., is negotiating for the purchase of the Coleman blast furnaces at Lebanon, Pa.

FOUNDRYMEN'S ASSOCIATION JOURNAL.

In Vol. IX. Part III of the *Journal* of the American Foundrymen's Association, just from the press, the secretary, Dr. Moldenke, presents a valuable resume of current foundry literature, both in this country and abroad. We make the following selections, which will be found of interest and importance:

Defective Brass Castings.

Eisenzeitung, September, finds the causes of defective brass work to be pouring too cold, bad mixing, poor molding sand, and finally wet sand. Only the finest grades of molding sand should be used, and this sifted several times through fine meshed sieves. Stale beer, yeast or molasses should only be added if the sand is very lean. Use the fine sand only next to the pattern, and fill up the flask with the coarser material, which will vent better. Ram the dry sand work harder than the green sand, and dust the latter with charcoal or graphite.

Where fixed colors are required the mixture must of course be made accordingly. Where, however, the work is to be galvanized afterwards, the amount of zinc in the mixture can be raised. This will not only cheapen the castings, but will make the metal run easier, of course, at the same time, weaken it. Where the proportion of copper is high a greater fluidity can be obtained by using manganese copper or phosphor bronze in the mixture. Protect the melt with pounded glass, borax or charcoal dust. This will prevent oxidation. As soon as fluid enough stir well, add a little tin, skim and pour at once without intermission.

Magnetic Properties of Iron and Steel.

Among the interesting reports presented to the American Section of the International Society for Testing Materials was one on the above subject, the secretary of the American Foundrymen's Association being a member of the special committeed appointed for the investigation. Considerable progress has been made, and in view of the growing importance of steel and iron castings in the electrical field the points under discussion and experiment will be of interest to our foundrymen. The first question is to determine the most accurate method of making permeability and hysteretic tests of magnetic materials. Next comes the per cent loss in permeability due to scale on iron and steel castings. Then comes the per cent change in this permeability of iron and steel castings that is brought about by chilling. Then comes the effect of position-in-the-mold on the permeability of cast iron and cast steel. These are matters which have a bearing upon methods of molding, etc., for the castings are made with a view of bringing out these points very strongly, and will naturally show how and how not to prepare a dynamo casting. The other three questions fall into the line of rolled and hammered metal. The test castings for cast iron were prepared by your secretary, and those of steel by the Union Steel Casting Co. of Pittsburg, Pa., all being donated in the interest of science. It will be possible to record some interesting results in the near future, the work being well in hand. The magnetic permeability of a casting is its conducting power for the lines of magnetic force. Hysterisis is the lagging behind and consequent impairment of the magnetization incident to changes in this magnetic force.

Crushed Cast Iron for Grinding.

Eisenzeitung, Oct. 18th.—Those who have investigated the various crushed metallic products for grinding purposes will know that nothing is superior to burnt saw steel hardened and crushed. In Germany, however, a white cast iron is sold quite extensively, and the method of making it is given herewith. It is necessary to produce a material which upon crushing does not yield too much powder, for this is practically inert for cutting purposes. This means that the size of the pieces to be crushed should not exceed a nut or bean, be not too brittle and be white throughout.

In pouring the stream of melted iron it can be divided into shot by directing against it a strong jet of water, or even compressed air. The size of the shot can be regulated tolerably by varying the direction and intensity of the jet of water or air with respect to the stream of melted iron, which may also be varied in thickness. Another method is to provide a disc of iron in which are cast radial grooves; this is placed directly over the water and rotated. The stream of iron bounds upon the plate and scatters into globules which are chilled by the water. By varying the speed of the disc the size of the shot is determined. The ordinary methods of stamping and sorting are used to make the crushed iron marketable. It may be added that only low silicon irons are available for this work.

Pressed Steel Flasks.

Eisenzeitung, No. 51, describes a patented flask made of wrought iron. From the numerous cuts accompanying the description one can see that they are excellent examples of the blacksmith's art, and the thought comes to us Americans, "why not make them of pressed steel?" It is said that these light handy flasks are rapidly replacing the heavy cast iron ones now in use in Germany, one foundry alone using over 1,000. There are 15,000 now in use, and their lasting qualities and lightness are certain to give them a good footing in the trade, As made over there they would be too expensive for us, but a pressed steel article should be economical enough here.

A. F. A. AT THE PAN-AMERICAN EXPOSITION.

Announcement has already been made in these columns of the fact that the convention of 1901 of he American Foundrymen's Association would be held at Buffalo, June 4, 5 and 6, and that visits to the Pan-American Exposition would be a chief feature of the convention. Secretary Moldenke visited Buffalo recently and had a conference with representative foundrymen arranging the preliminaries. Much interest was taken in the meeting, and it is the purpose of the Buffalo foundrymen to make their part of it so attractive in the features they will offer, that a very large attendance will be insured. The following committees are announced:

Committee on Finance and Entertainment.—Chairman, O. P. Letchworth, Pratt & Letchworth Co.; E. C. Lufkin, Snow Steam Pump Co., Buffalo, and Holly Mfg. Co., Lockport, N. Y.; W. Perry Taylor, Bingham & Taylor; P. H. Griffin, New York Car Wheel Co.; Lyman Hubbell, Fillmore Avenue Foundry; C. M. Farrar, Farrar & Trefts and East Buffalo Iron Works; C. C. Bolton, M. A. Hanna & Co., Cleveland; C. M. Greiner, Buffalo Pitts Co.; W. A. Rogers, Rogers, Brown & Co.; Gibson Howard, Howard Iron Works; Van Loan Whitehead, Whitehead Bros. Co.; Frank B. Baird, Buffalo Union Furnace Co.; Jas. S. Kingsland, Buffalo Foundry Supply Co.; Chas. M. Helmer, Hall & Sons; Geo. D. Hayes, U. S. Cast Iron Pipe & Foundry Co.; F. H. Stevens, Brooks Locomotive Works, Dunkirk, N. Y.; E. P. Seldon, Erie City Iron Works, Erie, Pa.; Geo. Linnen, Buffalo Scale Co.; Henry Bond, American Radiator Co.; E. C. Shafer, American School Furniture Co.; H. H. Hewitt, Magnus Metal Co.; E. C. McCarthy, Beals & Co.; E. C. Neal, Weed & Co.

Committee on Reception.—Chairman, Henry W. Wendt, Buffalo Forge Co.; Geo. M. Trefts, Farrar & Trefts and East Buffalo Iron Works; Lawrence Ginther, J. Ginther's Sons; Jas. J. Lawler, Lawler Iron Works; Albert Hoppin, Edward P. Allis Co.; Chas. F. Bingham, Bingham & Taylor; Robt. Hickok, H. G. Trout & Co.; R. K. Noye, Jno. T. Noye Mfg. Co.; H. S. Madden, Howard Iron Works; Geo. A. Lautz, Niagara Machine & Tool Works; Chas. F. Dunbar, The Buffalo Foundry Co.; W. C. Houck, Pratt & Letchworth Co.; J. C. Bradley, The Pratt & Letchworth Co.; E. G. Felthousen, Acme Malleable Iron Co.; T. J. O'Brien; J. H. Ludwig, Buffalo Co-operative Stove Co.; Nathanial Jewett, S. S. Jewett & Co.; Jno. Dobbie, Dobbie Foundry & Machine Co., Niagara Falls, N. Y.; D. A. Hixson, Gardner Foundry Co., Lockport, N. Y.; Josiah Ross; Jno. W. Pohlman, Broadway Foundry Co.; Henry M. Brown, Brown Car Wheel Co.; Orrin Bryant, Bryant Iron Works; Henry R. Clark, Clark Mfg. Co.; Robt. S. Cox, American Car & Foundry Co.; J. O. Gould, Gould Coupler Co., Depew, N. Y.; Samuel S. Baird, S. H. Baird & Co.; Chas. G. Shepard.

Press Committee.—Chairman, S. W. Spear, East Buffalo Iron Works, secretary Buffalo Foundrymen's Association; W. F. Wendt, Buffalo Forge Co.; Dr. Richard Moldenke, secretary American Foundrymen's Association, Box 432, New York City; J. A. Penton, secretary National Founders' Association, Detroit; Gibson Howard, Howard Iron Works; Chas. Kirchhoff, editor *Iron Age*, New York City; B. M. Gardner, *The Iron Trade Review*, Chicago.

RENEWING STEEL RAILS.

The proposition to renew steel rails by restoring the balance of section disturbed by wear has been developed beyond the experimental stage. This is indicated by the results obtained with the renewed rails in actual service and that the results can be relied upon is promised by the completeness with which all details have been considered in the process. The full measure of benefits to be derived from this treatment was not at first appreciated but has come to light by a process of evolution. The original plan was suggested by the unsatisfactory results obtained by the road with which the inventor was then connected in repairing battered rail ends by sawing off the battered portion. It was conceived that by a process of rerolling the battered and worn rails might be restored to a symmetrical section of slightly less dimensions than the original and thus be made capable of filling out the natural measure of their existence.

Early in the carrying out of the process, however, it appeared, and seems since to have been demonstrated, that there were other benefits. The process of rerolling after the rails had been in service for a considerable period not only restored the displaced metal to approximately the original section and filled the place of that which had been worn away by a rearrangement of the metal such that practically the whole section contributed its quota to the deficiency, but also added to the wearing qualities of the rail. This effect seems to be due both to the more thorough working of the metal and to the low temperature at which the rails are given the finishing passes. The knowledge thus obtained has come as a very satisfactory answer to the question frequently raised as to what should be done to secure in modern rails the wearing qualities of those made when the steel rail was in its infancy. It has lately been put to a practical application in rolling new rails in a process in which a brief interval for cooling is allowed before the rails are subjected to the finishing passes.

So far as railroads are concerned, however, the value of the process seems to consist chiefly in the opportunity afforded for obtaining in useful service the whole amount of wear of which the metal is capable. Most large systems, though having a heavy section, which is called the standard, use a considerable variety of weights of rail for the various purposes of branch lines, sidings, yard tracks, etc. There is, therefore, no occasion for selling or scrapping a rail because of its being below the standard weight per yard, provided its section is regular or can be made so.

In the process referred to, the reduction in weight per yard incidental to the rerolling varies from 6 to 10 per cent, according to the condition of the rail when offered for treatment. The fact once being accepted that a worn rail can be reproduced to perfect section of a slightly less weight per yard, the balance of the proposition is simple. With the understanding that removal from the track for rerolling is no more an indication of rails having outlived their usefulness than the shopping of a locomotive for general repairs indicates the end of its career, it would become the part of good judgment to remove rails a year or two earlier than is now the custom when turning and relaying in secondary track is the only intermediate step prior to scrapping. By this method the cost of rerolling would be reduced, the reduction in section would be less, and consequently a greater portion of the metal would be retained for a longer period in the position subject to the greatest wear.

The possibility of starting with a rail of a section weighing 100 pounds per yard, obtaining its ordinary full service in this condition, restoring it as a 92-pound rail as good as, if not better than a new rail of the same section, and following down in a regular progression of substantially new rails of 85, 78, 72, 65 and 56 pounds per yard, is pleasant to contemplate. When there is obtained, also, the ordinary period of service which may be expected for each weight between the periods of rerolling, with a remainder in the shape of a light railway rail or scrap, valuable in proportion to its weight, there is offered one of the most attractive propositions ever presented to railway managements. Not the least attractive feature, furthermore, is the fact that nowhere in these five or six rail lives does the price of billets intervene as a disturbing element.

The value in terms of expectation of wear of the rerolled rails will depend, of course, largely upon the care with which the process is carried out. So far as the workings of the process have now reached there is nothing apparently impossible or even improbable in the continuous series of reworkings above outlined. If nothing of an adverse nature develops in the course of further practical experience, it seems as if an economic solution of the questions how to get more wear from and what to do with old steel rails has been reached, in the discovery of a process of repeated rejuvenation.—[Railway Age.

The Lake Superior Consolidated Iron Mines of New Jersey and the Commonwealth Iron Co., of Ohio, commenced suit against the Salem Iron Co., of Leetonia, O., in the United States Circuit Court at Pittsburg last week, for damages resulting from alleged failure to carry out certain contracts. In the statement filed by the Lake Superior Consolidated Iron Mines it is set forth that the defendant company made a contract with the plaintiffs whereby the former agreed to purchase 30,000 tons of iron ore at the rate of $4.85 per ton. The iron was to be taken from the Minnesota mines of the plaintiffs to some port on Lake Erie where it was to be transferred to the railroad. The $145,500 was to be paid in twelve installments, but the plaintiffs declare that the Salem Iron Co., after accepting and paying for 2,543 tons and 1,030 pounds of the ore, refused to take the remainder, which had already been transported to Lake Erie. It is claimed that it was impossible to dispose of the ore to any other party at that time, as all orders for iron ore are given at a certain season of the year and the time was then past. The Lake Superior Consolidated Iron Mines therefore claims damages amounting to $48,048. The suit of the Commonwealth Iron Co. is somewhat similar. It is claimed that the defendant company made a contract to purchase from the plaintiffs 30,000 tons of Granada ore at $5.30 per ton. By agreement, they claim, Lerida ore was furnished instead of Granada. The contract amounting to $159,000 was to be paid in twelve installments. The plaintiffs aver that after the defendant company had accepted and paid for 5,263 tons and 380 pounds of the ore they refused to accept the remainder, which had been transported to Lake Erie and was at their disposal. Judgment is asked for $43,283.

The recent statement of its condition on Nov. 30, 1900, sent to stockholders by the American Car & Foundry Co., shows the following earnings for the fiscal year: Balance for period ending April 30, 1900, $3,698,648.74; net earnings for seven months ending Nov. 30, 1900, $2,547,227.26; total, $6,245,876. The dispostition of the same is as follows: Dividends (3) on preferred stock, $1,559,075; dividends (3) on common capital stock, $445,450; total, $2,004,525; balance Nov. 30, 1900, $4,241,351.

Blast furnace No. 2 of the Lorain Steel Co., Lorain, O., has resumed, after a seven months' idleness. All departments of the plant are in operation. Extensive repairs have been made on engine 5, and on the stone foundation of one of the furnaces.

An inspection was made recently by prominent railroad men of the Hardie compressed-air locomotive, manufactured by the Compressed Air Co., Rome, N. Y. The locomotive was operated on the New York Central tracks and the test proved satisfactory.

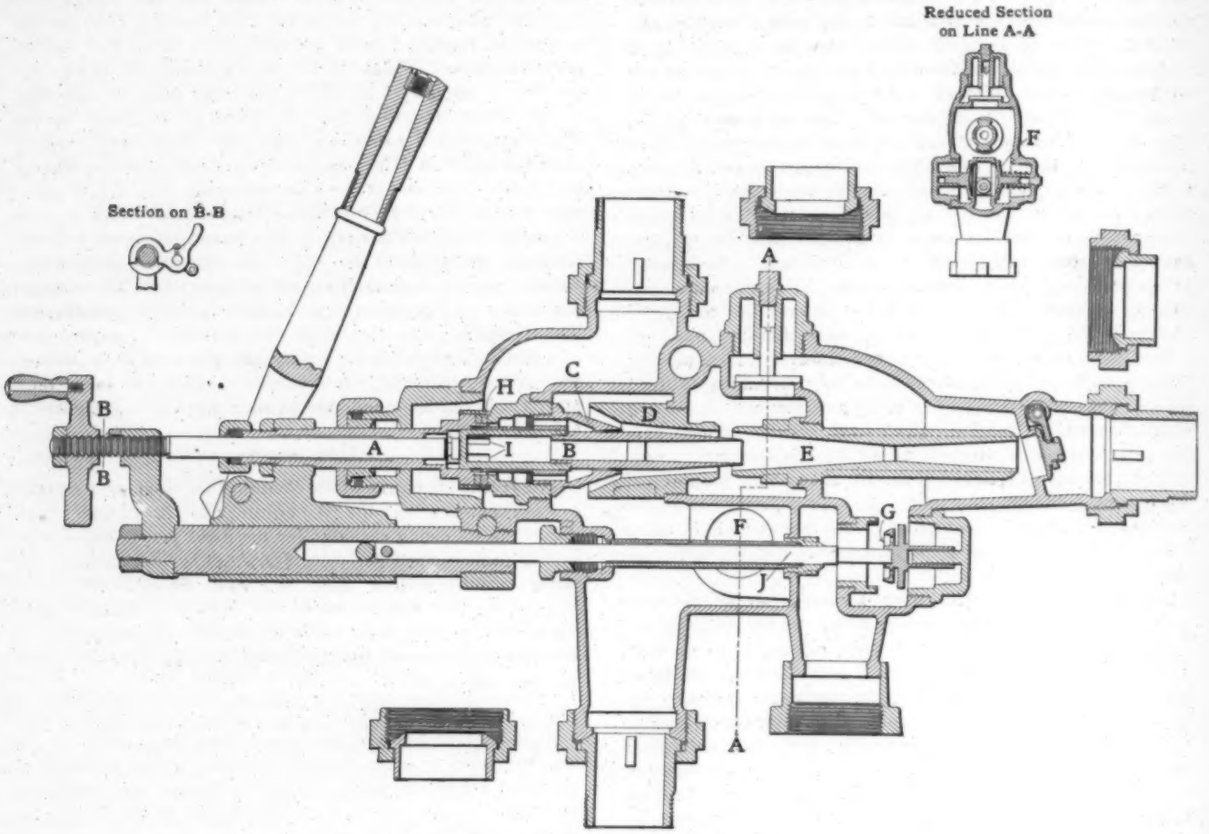
The Cleveland plant of the American Shipbuilding Co. will build two side wheel passenger steamers for A. McVittie, of Detroit. They will each be 320 ft. long, and will each cost $650,000. Delivery is required at the opening of navigation in 1902.

A reduction in wages of 10 cents per day went into effect on Feb. 1 at all the independent blast furnaces in the Mahoning and Shenango valleys, affecting over 3,000 employees. The reduction restores the wages to the figure before the advance of a year ago. The employes of the Stewart furnace, Sharon, Pa., refused to accept the cut, and were given ten days to consider the matter.

Claire Furnace, Sharpsville, Pa., will blow in Feb. 11, after being idle several months.

LUNKENHEIMER '99 MODEL STANDARD INJECTOR.

We give below a sectional view of the new injector which the Lunkenheimer Co., of Cincinnati, O., has just placed upon the market. The construction is novel in a number of particulars. Referring to the cut it will be noted that by pulling the lever slightly the steam valve H is withdrawn from its seat and steam is admitted to the lifting steam jet C, through the annular space around the movable steam tube B. Steam flowing into the water lifting tube B forms a vacuum in the water supply pipe and the water is "lifted" and passes out through the check valve A and the delivery tube E past the overflow valve G to the atmosphere. Drawing the handle further back opens the ports I-I in the movable steam tube B, thus admitting steam to the interior of said tube, which forces the water through the combining tube E past the line check to the boiler, due to the closing of the overflow valve G, occasioned by the withdrawal of the rod J. The principal feature in this machine is that the regulation of the water is accomplished by the movement of the movable steam tube B, the amount of which is controlled by the crank handle at the end of the machine. On this account it differs from all other forms of injectors inasmuch as in cutting down the discharge of water, the steam consumption is reduced in direct proportion. In all other forms of injectors the steam supply remains constant, while the water supply alone is reduced.



LUNKENHEIMER '99 MODEL STANDARD INJECTOR.

The manufacturers claim for this injector that it will start promptly under most conditions and can be depended upon to work reliably at all steam pressures from 25 to 300 pounds and higher; further, that it is distinctively a high pressure injector designed particularly for that service. It is also self-adjusting, is not affected by variations of steam pressure, even within great limits; when started, for instance, at 70 pounds it can be relied upon to work uninterruptedly to 300 pounds, and a sudden reduction in pressure would not disturb its action. The mechanical advantages include easiness of making repairs and other details.

Several steel companies have been negotiating recently with H. W. Lash, of the Garret-Cromwell Engineering Co., Cleveland, with a view to employing the Talbot open-hearth process, which Mr. Lash has in hand for the United States. It is expected that arrangements will be made for its introduction at one or two plants in the near future.

DISPOSAL OF BRASS SCRAP.

In the process of turning and finishing brass castings considerable quantities of chips are produced which have to be used up by the brass founder. If these chips were always clean, their disposal would not present serious difficulties; but, however careful the finisher may be, the chips always contain some iron, which must be removed before melting. This is effected by hand magnets or by magnetic machines. In any case, the iron or steel is only partially removed, as the more minute particles are very successful in eluding the magnets, and if the metal when so cleaned is used for small castings that are to be rapidly machined, the presence of these small particles of iron becomes a serious matter, because they do not melt and alloy with the brass, but are held in suspension and are distributed by the stirring, skimming and pouring throughout the metal and are found imbedded in the castings in small specks of extreme hardness, and when these specks come into contact with a delicate tool, that tool will suffer, if it is not utterly ruined. The loss is often serious, as in many cases the tool has been made especially for the particular job and would have lasted the job out if the metal had been clean and soft.

When it is necessary to use chips in small castings, chemical means can be resorted to to remove the finer particles of iron. They may be rusted out by mixing the chips with salt, wetting with water, letting stand for a few days and then washing in running water. A quicker, and by some claimed a better way, is to first remove grease either by burning or by the use of lye or common soda, and afterward to boil the turnings in a strong solution of alum.

If the founder is making castings of a low grade, with little machine work on them, the disposal of chips is an easy matter, as, after the bulk of the iron has been removed by magnets, they are clean enough for his purpose. His trouble is merely one of melting. There are several methods of disposing of this difficulty. In some shops the furnace-tender and his helper will occasionally work evenings or on Sunday, running the chips into ingots. Another plan is to fill up the worn-out crucibles with borings and set them in the fire at night, after the regular heats are out, throw in a little fuel, open the drafts, and leave until morning, when the crucibles are broken

open and the metal is obtained in the shape of a "heel." Still another method is to put a given quantity of chips in every pot when charging.

In pouring metal it is not always possible to avoid spilling some; if this spilled brass is not promptly cared for it becomes a source of loss. Although it may not be convenient to sweep the shop oftener than once a week, the larger pieces of brass should be collected every morning and used up during the day. The sweepings should be sieved to remove the brass, which is washed, cleaned of iron and promptly used up. The sand may be used in core-making or thrown away, according to circumstances.

Considerable is lost by abrasion on emery wheels. This is difficult to utilize, as it is intimately mixed with emery. Owing to this, it is not easy to melt and is often allowed to accumulate, until its disposal becomes a serious problem. Unless it is saved for a definite purpose, it should be constantly used up by putting a little in each pot. Some firms use this dust in making thimbles for plumbers and save it for that purpose, mixing it with other scrap metal. If it is allowed to accumulate in any quantity it is best to dispose of it to the smelter.

Another thing that will bear constant watching is the hearth on which the pots are skimmed. It ought to be cleaned every morning, the ashes being sieved and all cleaned metal and coke picked out. The residue is used to pack among the castings in the tumbling barrel, where it helps to polish the castings and is itself cleaned in the process. When it has become bright and clean, it should be picked over and the iron and clinkers removed, after which it may be divided among new metal or run into ingots.

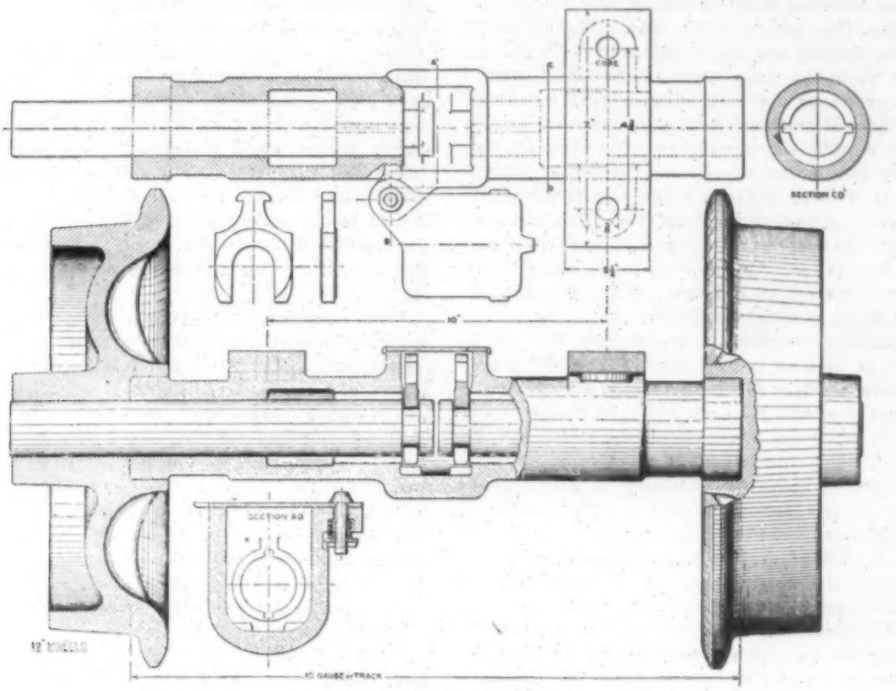
Old crucibles should be broken up and cleaned of the metal adhering to the sides, and when the ashes are removed from the furnaces all the clinkers and pieces of brass are picked out. The clinkers ought to be pulverized, by tumbling dry, with heavy pieces of iron, and the resulting dust sieved to recover the brass, which is generally found in the form of small shot.

Aluminum should be skimmed on a separate hearth and the skimmings cared for separately, for if mixed with the brass it causes discoloration.—[C. Vickers, in American Machinist.

At a meeting of the directors of the Robert Field Co., Columbus, O., on Jan. 17, the following officers were elected: Thos. E. Steele, president; Henry C. Pirrung, vice-president; Robert Field, secretary and treasurer. Mr. Steele is a Columbus attorney. Mr. Pirrung is president of the Capital City Dairy Co., Columbus. The company has removed its offices to the Hayden Bldg., and will be located there until the completion of the new Ohio Trust Bldg. adjoining.

ANACONDA SELF-OILING AXLE.

A patented self-oiling car axle designed for mining cars and narrow-gauge cars for contractors and furnace and industrial use, is shown in elevation and in section in the illustrations below. The axle is made in halves, both wheels being pressed on. A cast-iron sleeve serves as a support for the axle and as an oil reservoir. The sleeve is bored to fit the axle. From the center for half its length the sleeve is counter-cored to provide an oil groove. The sleeve enters about 1½ inches into the hub of each wheel, with a sufficiently close fit to prevent the loss of oil. The object in having the axle divided in the center is mainly to allow for variations in number of revolutions of opposite wheels in passing curves and other bad tracks. This avoids wear and allows the car to be hauled with ease. Cold rolled steel, 1⅝-inch or 2-inch, is used for the axles. The inside end of the half-axle is provided with a groove, into which is placed a small fork-shaped brass casting, straddling the axle and serving to hold it in position. At the center the sleeve is enlarged and provided with an opening of sufficient size to serve as an oil reservoir. A pressed wrought steel cover is hinged over the opening, serving to retain the forks in position and to keep out dust and dirt. This cover can be slipped to one side to permit oiling, or, when necessary, to take out the forks and remove the wheels and axles. These axles require oiling but once in two or three weeks. Each sleeve is provided with two lugs for attaching either wooden or iron car bodies. All parts are made to exact gauges, and are absolutely interchangeable. There is no bolt, nut or piece of any kind which will become loose or be lost in service. Axles are made to suit any gauge from 18-inch to 40-inch. The wheels usually furnished are 12-inch in diameter with chilled tread, of the form shown. The manufacturers are the American Engineering Co., of Chicago.



ANACONDA SELF-OILING AXLE.

The Utica (N. Y.) *Daily Press*, in its columns of Jan. 19, presents a list of the power users of Utica, N. Y. The growth of Utica has been entirely dependent on the introduction of steam power for manufacturing purposes. The first impetus given by the use of steam dates from 1846. At present there are in the city 177 engines, having a theoretical maximum of 19,535¾ h. p. A further opportunity for growth to the city lies in the production of electrical power from Trenton Falls. This can be transmitted across country at 20,000 volts. Trenton Falls is capable of producing 7,500 h. p. of electrical energy at lowest water in summer.

UTILIZATION OF TIN CLIPPINGS.

Tin clippings, which less than four years ago were regarded as desirable material for filling in and dumping purposes, at present are commanding as high as $10 and $12 per ton f. o. b. cars and there is every indication that the price will go higher, owing to the unusual demand for shipment to Holland and Germany. The detinning industry of this country, although still in its infancy, is already large enough to consume a large portion of the tin clippings produced here, and the domestic as well as the foreign demand is sufficiently strong to uphold present prices. Three years ago these clippings could be purchased at $2 per ton, and pervious to that time stamping works and tin can manufacturers were often at a loss to know how they could dispose of this waste. It might be stated in this connection that discarded tin cans are not classified under the head of tin clippings, and the plants of the country that detin the clippings draw the line on discarded cans owing to the presence of a large amount of solder.

From experience it has been found that one ton of tin clippings will produce about 50 or 60 pounds of tin, which is secured by treating the clippings either by an electrical or chemical process. A tin oxide is secured which can either be resmelted or can be sold to enameling plants in oxide form, the condition of the market nearly always deciding this question. Nor do the detinning concerns realize only on the tin or tin oxide which they secure in this way. The detinned steel, which is now nothing less than clippings of black sheets, is marketable at about the same price as the tin clippings command, and there is an ever-increasing demand for these steel clippings. Several machines have been invented within the past eighteen months which compress these clippings by hydraulic pressure into blocks, usually one cubic foot in size, The weight of one of these blocks is approximately one-third the weight of a piece of steel of the same size. This material is being used largely in open-hearth furnaces, where it has been found that little of it is lost. On the other hand, where these clippings have been treated in ordinary cupolas it has been found that much of the material disappears.

Experiments have been made during the past few years with the purpose in view of melting the tin from the black plate. At Pittsburg a rotary furnace was experimented with for some time, but it proved a failure owing to the fact that the tin would not run from the steel, although it could be readily wiped off. Detinned clippings are required to be absolutely free from all traces of tin, owing to the action it has on the steel. It has been found that it affects the steel the same as phosphorus, rendering it brittle.

In Germany and Holland the detinning processes are far in advance of those in this country, and the detinned steel is considered excellent scrap material for open-hearth practice. The demand from these two countries has nearly doubled within the past two years, which is undoubtedly due in part to the increase in the number of open-hearth plants in these countries, especially in Germany.

The tin clippings are largely secured from stamping and can manufacturing concerns, although the tin mills furnish a large portion of the material thus utilized. The demand has not yet been sufficiently great to induce dealers to gather the product from tinsmiths, but there is every indication that such will be the case before many years elapse. The discarded tin can now find its way into the cupolas of a number of foundries throughout the country, the metal being used for the casting of sash weights and other castings where weight and nothing else is desired. That his metal has weight is about all that can be said of it, and it has been stated that it is not sought after very eagerly by the trade for sash weights, owing to the extreme brittleness of the resulting material.

At Pittsburg, on the brow of a hill is located a plant that recovers the solder from tin cans. The cans are piled high in a furnace, and as the solder melts off it drops through the grate bars on to a bed of sand, where it is collected. This is by no means a remunerative business owing to the exceedingly small amount of solder recovered. The cans are then sold to foundries for casting sash weights or are hammered out flat and sold to trunk manufacturers, who use them in the manufacture of cheap trunks, for reinforcing corners, etc. The present prices that are being paid for tin clippings are higher than ever before, but the price of the detinned clippings is considered low, when compared with those of a year ago, when as high as $20 a ton was realized.

POINTS ON FOUNDRY IRON.*

By Captain Henning,
(Imperial Artillery, Berlin, Germany.)

One of the commonest arguments against chemistry in the foundry is the well known fact that irons of identical composition may show widely different physical properties, and similarly, good castings of a given kind may vary considerably in their composition. The importance of this situation makes it imperative to trace the causes for the apparent contradiction.

In every case of this kind which has come to my notice, whenever the pig iron showed the proper analysis, the blame has been placed upon the foundry. Poor molding, cold iron, unequal cooling, abrupt change of section, trouble in the place from which the test pieces were cut, or difficulties in making a separate set of test bars, are considered as the primary causes of failure to see predictions carried out. It is also known that the cupola itself has a great influence on results, for with the same mode of operations and material one day's run may be quite different from another.

My own experience in one foundry has shown me that different shipments of one brand of iron, in spite of a practically identical composition, may produce quite different results and that the foundry will not be to blame therefor. This particular foundry was accustomed to work so painfully exact that the conclusion was forced upon all of those interested that the root of the evil was to be looked for in the blast furnace. It is a well understood fact that even with the most uniform burden a blast furnace cannot make absolutely uniform pigs, so far as their composition is concerned, yet the end product will be comparatively more homogeneous than a cupola process could make it, for the quantities are much larger and the process is a continuous one. If, now, the greatest care is taken in running the cupola, and handling the molten metal, the unavoidable differences in composition in the castings made will be found to be quite unimportant if only the same care is taken with the burden in the blast furnace.

With a pig iron thus carefully made I have had no trouble whatever in producing a perfectly satisfactory run of castings where the composition ranged from 3.50 to 3.75 total carbon, 0.27 to 0.52 combined carbon, 2.62 to 3.22 silicon, 0.98 to 1.18 manganese, .60 phosphorus, .03 sulphur and .02 copper. The mixtures were naturally regulated very carefully with reference to pig and scrap. The percentage of impurities ranged from 7.50 to 8.10 per cent, the iron running 92.475 per cent on an average. Whenever the percentage of impurities exceeded 8.0, sending the iron below 92. per cent, the castings would become undesirable, porous and weak. When the impurities reached 9 per cent and over (I have sometimes had 9.36 per cent, which meant that the iron dropped below 91 per cent), the castings were unfit for use.

In my estimation the above limits are not absolutely final ones, for circumstances may circumscribe them much more closely. That the quality of the castings must suffer when the percentage of impurities rises is perfectly natural, but even with the same percentage of iron present, as, for instance, 92.475, as given above, or 92.22 per cent, as in another case where the impurities were 7.78, the difficulties may be greatly increased when any particular impurity goes up unduly. For instance, sulphur and copper may be too high, manganese, silicon and carbon too low.

Where the same brand of iron was used continuously and the quality of the castings gradually deteriorated in spite of a proper pig iron composition, the answer was more difficult. The determination of the iron contents finally solved it. This was found to have gradually dropped from 92.475 per cent down to 91.0 per cent and even below, and resulted from changes in the furnace burden. It was found that in the hope of improving the pig iron for foundry purposes and getting a specially fine fracture the carbon was brought up to 4. per cent the silicon from 4.10 to 4.34 per cent, manganese to 1.23 per cent, phosphorus 0.6 per cent, sulphur .055 per cent, and copper from .02 to .10 per cent.

As I know of pig irons which are sold as among the best and still contain 4.9 per cent total carbon, silicon 2.0 to 2.50

* Prepared for the February (1901) meeting of the Foundrymen's Associations.

per cent, manganese .6 to .7 per cent, phosporus, .94 to 1.20 per cent, and sulphur 0.10 to 0.14 per cent, it is not to be wondered that the results would be poor. Where the percentage of iron is dropped down to 89.65 per cent instead of being 92. per cent, castings must be failures. The tendency of German furnaces is to burden the furnace to produce a maximum amount of silicon. The result is a maximum of other things not so desirable, and the complaints heard so often about bad iron are fully justified. The trouble with furnace men seems to be the all too frequent practice of using mill cinder in the burden. This, of course, promotes smoother running on the part of the furnace, helps to avoid explosions and cheapens the run. If this slag and cinder is added judiciously it certainly helps the foundryman, but how few of them exercise the necessary care. My own experience indicates that irons made with the use of plenty of cinder for washing purposes furnish a foundry pig iron which is unreliable, weak, and of very little value for critical work when compared with the "honest" pig irons.

From the above remarks we will see that chemical and physical investigations are of great value to the foundry industry and that the same class of investigations are equally necessary at the blast furnace if good results are to follow regularly. For a proper exchange of opinions and for purposes of record all chemical and physical investigations should be conducted on standard lines. Uniformity in test bars and methods of analysis is very essential not only where simple information is wanted, but also for trade purposes. Fortunately, Europe and America are working hand in hand in this direction. If, as it seems, there is a general demand on the part of consumers to get a better grade of castings, be it through an improvement of the cupola product or in the original pig irons used, this demand will have to be satisfied or attention will be turned in a still greater measure to furnace iron and steel castings. A comparison of the analyses mentioned above with those which follow will show this.

Cold blast charcoal iron usually runs 3.00 to 3.50 per cent carbon, .60 to 2.00 silicon, .40 to 1.00 manganese, .15 to .25 phosphorus, and .02 to .04 sulphur, or 4.17 to 6.97 per cent impurities and 95.83 to 93.21 per cent iron. Compared with the pig irons discussed in the early part of this paper a marked improvement may be readily seen. Steel castings similarly show only .74 to 1.44 per cent impurities and 99.86 to 98.56 per cent iron. It is evident that coke irons as now produced show a tendency to slip through altogether too great a percentage of impurities, and indeed America has recognized this fact by an enormous expansion of its steel casting industry.

In closing this article I beg to acknowledge the disinterested kindness and assistance rendered me by the management of the Zawadyki Foundry, by General Manager Esser, of the Upper Silesian Railroad Co., and the laboratories of Dr. Carl Heyer in Dessau.

POWER HOUSE OF ARTISTIC DESIGN.

The National Cash Register Co., of Dayton, O., of whose system of improvement features, that have regard for the comfort and the intellectual development of employes, much has been written, embodying advanced ideas in a power house now under construction at the plant. The *Engineering News* presents a preliminary sketch, showing that the architect has sought for artistic effect as an end, after having provided the essentials of a thoroughly modern power building. In addition it shows the section of the power house which we reproduce herewith. The entrance to the building, which has two stories, is from either side of a one-story vestibule at the front, from which the stack rears itself 200 feet in the form of a massively built rectangular tower. The building is of red pressed brick, about 160 feet long and 120 feet wide.

The new plant will have 1,800 rated horsepower in boilers and 2,100 horsepower in engines and generators. Provision will be made for a future increase of 1,000 horsepower in boilers, engines and generators. The preliminary sectional drawing shows the general arrangement of the building. The boiler room will be depressed to permit of a gravity coal-handling device, and also to give a convenient location for pumps, piles, etc., from which the engine room will be entirely free. Tunnels will be built to carry the electric cables and steam and water pipes to the different buildings. The building and plant will be completed in about a year, and the total cost is estimated at $85,000.

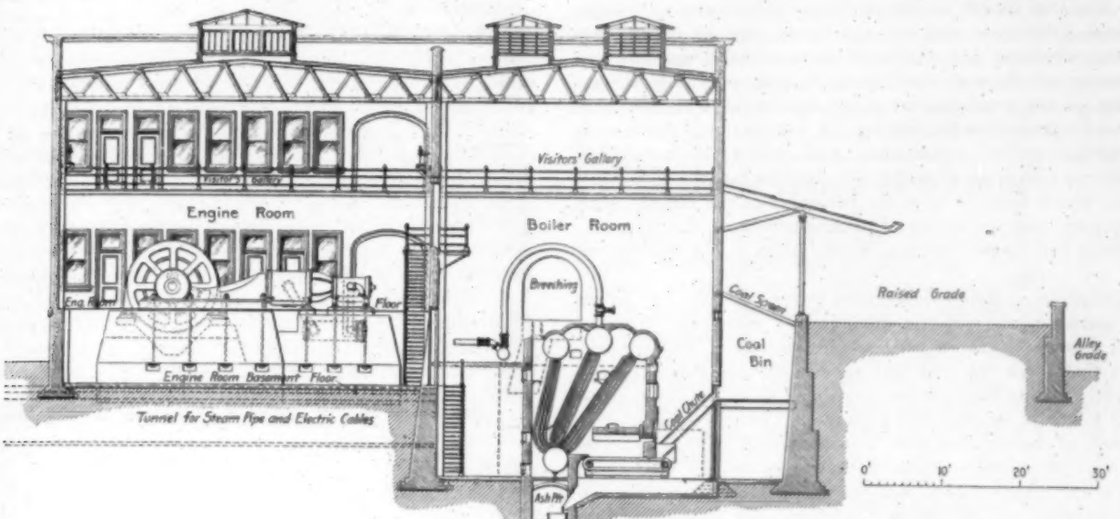


FIG. 1.—SECTION OF POWER-HOUSE FOR NATIONAL CAST REGISTER CO.

Bids were opened by the Navy Department in Washington last week for the construction of three protected cruisers. Naefie & Levy of Philadelphia bid for one cruiser at $2,741,000; the Newport News Shipbuilding Company at $2,741,000, and the Bath Shipbuilding Company at $2,750,000. A fourth bid was from the William R. Trigg Company of Richmond, Va., one cruiser at $2,780,000 or two at $5,440,000. These three cruisers are designed to be the most formidable vessels in the world of their class. They will resemble closely the type of second-class armored cruisers. The new vessels are to be named the St. Louis, Milwaukee, and Charleston, the last to continue the name of the ship wrecked November 2, 1899, in the Philippines. Their trial displacement will be about 9,700 tons each, they will be equipped with 21,000 horse-power, twin screw engines and will have a speed of 22 knots per hour. The vessels will be 424 feet in length and 66 feet in extreme breadth. Their bunkers will have a capacity of 1,500 tons of coal.

It is reported that the Arcade File Works, Anderson, Ind., the largest file plant west of New York State, has gone into the new combination of file manufacturers initiated by the Nicholson File Co., of New York.

ARBITRATION IN PRACTICE.*

BY H. W. HOYT.

"If voluntary arbitration will tend to solve industrial problems along the lines of least resistance, how can it best be attained in this country?" is one of the questions suggested in the call for this conference. The industrial problems, so-called, can be adjusted in a large degree along the lines of least resistance, and the line of least resistance in my opinion is voluntary arbitration. The highest conception of arbitration is that of an unbiased conference board—a judicial body composed of arbitrators outside the sphere of influence exerted by the contending parties. Another idea, approaching more nearly the practical, is that of a board consisting of equal numbers from the two bodies, with an umpire chosen by both.

Each of these conceptions of an arbitration board, however, has failed to satisfy the parties in interest or to solve and settle industrial disputes. The best thinkers, who are also charged with the trying duties of practical arbitration, have about decided that unless satisfactory settlements can be reached by an equal number of representatives of employer and employe, without an umpire, the conference would better fail. The future economist may be wise enough to present to a waiting world some plan of arbitrary or compulsory arbitration acceptable to the wage earner and wage payer, but we fear that genius is not yet born. While waiting for his advent, arbitration will go on. Every day we realize that public sentiment is crystallizing around that thought. The dawning century will inherit from the past no more significant token of the evolution of peace and good will than this acknowledgment of the efficacy of conciliation. Arbitration invariably means compromise, and unless the contending parties are prepared to accept this absolute fact the work must fail. Much depends upon the personnel of the board. How important that the choice of arbitrators should fall upon the clearest and deepest thinker, whose vision is not obscured by his prejudices.

Questions of difference between buyer and seller are as old as mankind, and yet the dominion of commerce illustrates how easily adjustments are made in that realm. The admitted fact that there are well nigh insurmountable difficulties frequently arising between the buyer and seller of labor, shows that a new proposition has been met. The purely commercial aspect of barter and sale is complicated with the human element in questions relating to wages, and he who would settle the wage problem without taking humanitarianism into the account, will not serve his fellow men acceptably. The old law of supply and demand, strictly interpreted, does not avail to adjust all disputes that arise in the economic world. The competent arbitrator must acknowledge this. The employer who admits no other rule of action is unwise.

What Founders and Molders Have Done.

There has been an infinite amount of trouble in conferences for conciliation and arbitration caused by insistence upon rules of conduct evolved in the local lodge room and forming the unwritten laws of unionism, laws often unsanctioned by supreme authority and at variance with the traditions of the national body. To refer to these in detail would be to provoke unwarranted contention at this time. Equally provocative of trouble has been the tendency among some employers to ignore wage earners in their collective capacity. Some time these two great forces will learn that the intelligent modification of their respective positions will extinguish the causes of what has too frequently been called an irrepressible conflict. It may require a great calamity in the industrial world of America to teach us anew some of the truths uttered by our forefathers and imperishably preserved in the Declaration of Independence.

The hope of averting destructive war lies in the spirit that prompted this conference and in its educative forces. I beg permission to speak briefly of the practical side of arbitration and to point out what has been done in one of the greatest fields of industrial activity, in the hope that the successes and failures recorded may inspire a lively faith in the achievements of those results which every sane man and woman will welcome.

The National Founders' Association is one of the practical results of the evolution of modern social economics. The fundamental article of its constitution is the very embodiment of voluntary arbitration, and reads as follows: "The objects of this association are: 1st. The adoption of a uniform basis for just and equitable dealings between the members and their employes, whereby the interests of both will be properly protected. 2nd. The investigation and adjustment by the proper officers of the association of any question arising between members and their employes."

This association was formed less than three years ago. It now numbers about 400 members throughout the great manufacturing centers of the East, Middle West and West. It employs an army exceeding 30,000 men. One of its earliest acts was a joint conference with the representatives of the Iron Molders' Union of North America for the purpose of considering an agreement that should form the working basis of a treaty of peace. This joint conference agreed upon a plan of arbitration which was subsequently adopted by the rank and file of both associations. It was an exceedingly simple and effective agreement, by the terms of which each body solemnly agreed that there should be neither strikes nor lock-outs in the foundry industry until arbitration had failed to adjust the differences. The wise provisions of this agreement have been invoked scores of times, with such flattering results that neither party, I believe, could be persuaded to consent to its abrogation.

The National Founders' Association is the largest organized body of employers in the United States committed to the altruistic object set forth in its constitution. The Iron Molders' Union, on the other hand, is one of the largest, best organized and intelligently governed labor unions in this republic. It is significant, therefore, to remember that during the eventful and intensely active industrial year of 1899 there was not a single disastrous strike or lock-out in the foundry industry, notwithstanding the conditions were such as naturally to provoke wage conflicts. These two great associations of employers and employes have not been as successful in averting all contention in the year 1900, but the very failures have emphasized the necessity and the wisdom of a still closer adherence to the principles of arbitration and conciliation, and a more profound study and examination of economic conditions.

The Spirit of the National Founders' Association.

Permanent results have already been definitely reached. It has been found possible for the representatives of the two organizations mentioned to meet and discuss the principles for which each is contending, without the slightest danger of personal animosity. Various conferences have been carried on, with a strong desire on both sides to reach a common ground by the exercise of mutual forbearance and concession. Failures to arrive at a harmonious decision, even in the face of impending industrial conflicts, have not destroyed faith in the success of the principle of arbitration. Each party has become more tolerant of the other. Friendly conferences, face to face with each other, have destroyed preconceived notions of each other's characteristics, broadened and deepened the spirit of toleration and gradually paved the way for eventual peace in that great industry.

An attempt has been made to nationalize the scheme of arbitration, in other words, to take away from each individual case of difficulty its strictly local character, and place the adjustment of it in regularly appointed committees chosen by both associations, which committees, by reason of their experience and broader horizon, are able to eliminate the local features and arrive at results in harmony with existing and accepted conditions elsewhere throughout the country. This course of action has gone far towards relieving the manufacturer from those petty annoyances which he has always associated with unionism, and at the same time has elevated and dignified the mission of those local and district officers of the Iron Molders' Union of North America. The consequence has been, that a more experienced, intelligent and tolerant body of men have been called into action, and that the rank and file of union men are rapidly becoming educated to the new method of dealing with their affairs individually and collectively, while the manufacturers have been educated to a more liberal and just consideration of their employes' interests.

The preamble of the constitution of the Iron Molders'

* An address before the National Civic Federation Conference at Chicago, December, 1900.

Union of North America begins with this declaration: "Believing that under the present social system there is a general tendency to deny the producer the full reward of his industry and skill," etc. Upon this declaration of want of faith in human justice is builded practically all there is of unionism. The searcher after truth cannot deny that there has been much justification for this assumption. The National Founders' Association has expended a great deal of energy in endeavoring to bring about a set of conditions which would destroy the force of such a charge against its members. As an evidence of the spirit which actuates the deliberations of the association, I desire briefly to quote from newspaper reports of the last two conventions of the National Founders' Association. Speaking of the Detroit convention, held in February, 1900, the report says: "If those who are pessimistic as to the outcome of the issue between organized labor and employing capital could have heard the discussions at the Detroit meeting and caught the spirit that dominated the convention, they would have learned that the declarations of the constitution are not glittering platitudes. It was gratifying to find that intelligent, well-equipped men in the ranks, are strongly seconding the efforts of their leaders to make just and equitable dealing the rule between founders and molders."

Another report of the same convention said: "No one could be present at the deliberations and hear the discussions of the National Founders' Association without being forcibly impressed by the high principle actuating the members. Primarily driven by the aggressions of labor and the arbitrary attitude of labor leaders into forming an association for de-employe was emphasized. Nowhere in the discussions was any seldom brought out. Instead of hostility to the workingman and his efforts to secure additional advantages, a humane interest was shown in his welfare and full recognition was accorded to his rights."

In discussing the proceedings of the last convention, held in November, this year, a newspaper report contains the following: "Division between capital and labor was deplored; the community of interest subsisting between employer and employe was emphasized. Nowhere in the discussions was countenance given to the doctrine of right by might, or any suggestion of peace on a basis that left out justice. If the sowers of discord between capital and labor could have heard the sentiments expressed by the leaders in debate, they might have imbibed a new idea concerning the attitude of the average manufacturer toward his employes."

The association of which I have spoken is a type of its class. It is most gratifying to note the success achieved by the kindred organizations. The general public is scarcely prepared to accept the simplest recital of the history has been made in promoting the principles of arbitration.

The Outlook.

What of the future? As long as the wage earner believes, or is taught to assume that society is in league to rob him, as an individual, of some of the purchasing power of his services, so long must society reckon with him in his collective capacity. The employer who selects to ignore this fact is often as much of a menace to the industrial peace as is that agitator who plays upon the prejudices and inflames the passions of the men he falsely serves. But the conditions are improving on both sides. The progressive manufacturer has learned that a union is not an altogether reprehensible evil in social economics, and readily admits that when organized wage earners are dominated by strong conservative men, they will meet the employer half way in arbitration.

Unions must remember that there never was an attempt made to unite manufacturing employers in the common cause of treating collectively with the relations of labor until the unions themselves had asserted their power. Both the employer and the employe must be honest enough to concede that their interests are mutual, and that the deep problems of economics cannot be solved in a decade. It is a slow evolution that cannot be hastened by violence or intolerance.

I am not one of those who can yet believe that arbitration will lead straight to the millennium. The questions involving wages, hours and shop conditions in their relation to the health, moral and physical, of the employe, can all be adjusted by the peaceful and enlightened process of conciliation if the leaders of thought on both sides are in earnest in desiring it. There are other deep questions raised by modern unionism of such far-reaching significance in their relations to what the world has long believed to be the inherent rights of life, liberty and the pursuit of happiness, that their solution may never be reached through the reason alone. There will be many discouraging failures to bridge that fearful chasm between the extremes of thought on these economic subjects. I conceive it to be the solemn duty, yea, the greatest duty of the men who today happen to be in some degree, the molders of thought on these profound questions, to spread the gospel of conciliation and arbitration, lest there come a crash between the economic forces in this land that will destroy the republic. I call upon those who are wage payers to study their relations to their employes with a determination to get at the equities and uphold them. I warn some of you that you have many prejudices to bury and much wisdom to gain.

I call upon those conspicuous leaders of labor unions to beware of the temptations begotten by the arrogance of power. It requires a strong and alert conscience to withstand the assaults of those temptations. Those organizations among employers, like the one which I have specially mentioned, are studying these questions conscientiously. They cannot and do not claim infallibility. They will feel the inspiration of such conferences as this and will welcome any tangible results. They have learned this much at least—that the cause of arbitration and conciliation has always flourished best in the genial atmosphere of tolerant discussion. There are no fixed rules for achieving success in the ministry of this peaceful art. All the theories of all the scholastics on earth are of little avail. There is only one safe rule of action and it is so simple and commonplace that its efficacy is too frequently ignored. It was long ago called "the Golden Rule."

A NEW SYSTEM OF WELDING.

Much interest has been aroused by the discussion of the welding process developed by Dr. Hans Goldschmidt, of Germany, in which by a chemical reaction a temperature is secured equaling or exceeding that of the electric arc. The affinity of aluminum and oxygen for each other is the basis of the process, and temperatures as high as 5,000 degrees F. have been secured. There have been obstacles in the way of applying this process to any practical work, mainly because of the difficulty in getting the reaction started and of its extreme rapidity when once under way. Dr. Goldschmidt, however, has succeeded in overcoming both these difficulties. He used powdered aluminum and a metallic oxide, the latter supplying the oxygen. These elements require a high initial temperature to bring about a reaction, but he discovered that by mixing with these a quantity of the chemical, barium superoxide, ignition could easily be started. This having been accomplished, he found that the combustion could be regulated by the manner in which the powder was added. This, in brief, is a statement of what has been accomplished chemically, but of more interest to those engaged in mechanical work are the results that have been attained through this discovery. An extended article fully illustrating various applications of the process already made in Germany appeared in a recent number of *Fielden's Magazine*. Its chief use, it is evident, will be for welding rails, welding lengths of wrought pipe and repairing faulty steel castings. Summarizing the processes in these lines, *Machinery* has the following:

The heating agent or powder has been patented and is known as "Thermit." The process of welding pipe consists in clamping together the ewo ends and then casting on the joint in order to bring the iron up to a welding heat. The increase in temperature causes the pipes to expand, but they are prevented from doing so longitudinally by the clamps. The expansion, therefore, taking place within a restricted area, acts as a welding force upon the pipe faces, pressing the hot iron together. For the whole operation there is required only a slag-lined fire-clay crucible, a pair of tongs, a clamp, a box of Thermit and some matches. Before the molten Thermit is applied the joint is surrounded with a mold of sheet iron, backed up with sand or clay, which acts as a receptacle for the Thermit when it is poured. The requisite welding heat is imparted to the pipe in a very short time and after the joint has been allowed to cool the solidified Thermit can be knocked

off with a few blows from the hammer, leaving the pipe clean and smooth at the joint. A peculiar property of the Thermit appears to be that it does not attach itself permanently to the pipe or other metal being welded, as might be expected.

The same process is used in welding rails, and in a number of instances where the experiment has been tried the welds have been found quite as satisfactory as the usual fishplate joint, besides being nearly if not quite as cheap, and in the case of electric roads affording better conduction of the current.

In repairing steel castings having imperfections, the Thermit is allowed to run into the blowhole where it remains firmly attached, owing to the irregularities of the surface. A remarkable and somewhat startling result that has been obtained in the application of this compound is in softening and even penetrating armor plate or plates used for safes or vaults. A nickel steel plate about 1¼ inches thick was easily penetrated in a short time by the application of molten Thermit, and a hole of any dimension could be made through such a plate by simply pouring the Thermit so as to follow a circular line enclosing what was to be the hole. An exceedingly valuable application of the compound appears to be that the welds stand well under test. Pipes which have been welded can be bent to almost any angle without disturbing the welded connection, and it is also believed that the process can be applied as cheaply as can flanged joints. The main difficulty in welding pipes is that one would be unable to remove a length which, however, in many instances where piping is expected to be permanent, would be of no particular disadvantage.

ARMSTRONG GANG PLANER TOOL.

The Armstrong Bros. Tool Co., of Chicago, has recently perfected a new device, whose construction and operation are shown in the illustrations below. It is the Armstrong gang planer tool, which is made in three sizes carrying respectively four, five and six cutters. This tool is especially adapted for surfacing large castings and on this class of work it is claimed it will effect a saving of fifty to seventy-five per cent in the time required to do the same job with a single point tool. As shown in Fig. 2 the head of the tool is solidly secured to the shank, on which it swivels to a limited degree, by means of a deep and closely fitted tongue and socket, and when set its position is fixed by means of two steel collar screws. The head is graduated, thus enabling the tool to be quickly and accurately set to any desired feed. Both shank and head are drop forged of steel and all parts are hardened. The set screws are tool steel tempered on the point.

Fig. 3 shows a cut taken with the No. 61 gang planer tool set to ¼ inch feed, distributing the cut 1-16 inch on each cutter. Each chip being comparatively light a planer with this tool will carry with ease a feed and depth of cut much greater than would be possible when using an ordinary tool and there is much less tendency to "break out" at the end of cut.

FIG. 1.

FIG. 3.

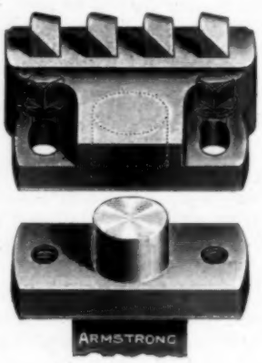


FIG. 2.

FIG. 4.

ARMSTRONG GANG PLANER TOOL.

The cutters are made from stock sizes and shapes of self-hardening steel which are readily obtainable. In grinding cutters it is of course necessary to obtain uniformity of shape and clearance. To enable this to be done easily and accurately there is furnished with each tool a gauge, shown in Fig. 4. To line up cutters to uniform depth it is only necessary to let them rest on a flat surface while tightening set screws.

The Ohio steel plant of the National Steel Co., at Youngstown, O., began work on orders aggregating 130,000 tons of steel rails on Feb. 3, which will keep it busy for three months. The plant has a daily capacity of 1,700 tons. Two new soaking pits have been lately added to the rail-finishing department, and at present the company is building two new straighteners and four drill presses.

The report that a new $1,000,000 tube plant will be established in Zanesville, O., has been confirmed by T. A. Beall, of New York, who is acting for the new concern. The daily capacity of the plant will be 800 tons of finished product. It will be finished by June 1, and will employ about 1,500 men.

At the annual meeting of the Marting Iron & Steel Co., of Ironton, O., the board of directors was increased from six to seven. The board now consists of the following: H. A. Marting, T. J. Gilbert, W. A. Murdock, H. A. Mittendorf, J. H. King and C. B. Fowler. H. A. Marting was elected president, C. B. Fowler vice president and T. J. Gilbert secretary and treasurer. A dividend of 50 per cent was declared.

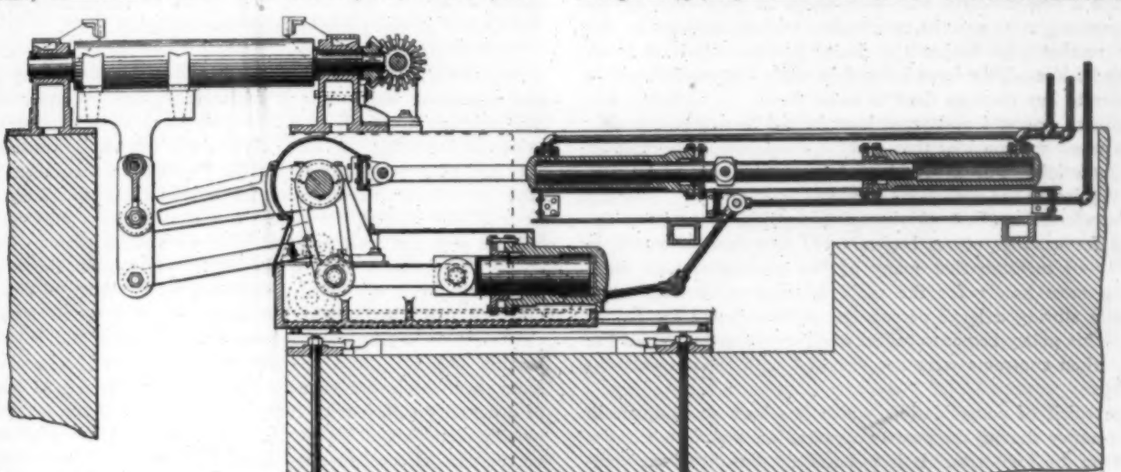
The Excelsior Foundry at West Bay City, Mich., has been awarded a contract by the Kilby Manufacturing Co., of Cleveland, O., for the manufacture of 800 castings.

KELLER INGOT MANIPULATOR.

Albert T. Keller, of Wilkinsburg, Pa., has invented an improved ingot manipulator of which a sectional elevation is given in the illustration. As is well known, it is desirable that the fingers, or portions of the manipulator directly operative of th ingot, should have a straight or approximately straight vertical movement. This has generally been obtained by arranging the lifting mechanism directly below the feed table. Such an arrangement is liable to injure the mechanism by the dropping of scale, etc., from the ingot. The invention of Mr. Keller puts the lifting mechanism proper outside the line of movement of the ingot on the feed table, and such portions of the lifting mechanism as project across the line of movement on the ingot, should have a straight or approximately straight the dropping scale. There is an additional advantage in keeping cylinders and other parts out from under the table, because they are easier of access for repair work, repacking of glands, etc.

In Mr. Keller's manipulator the fluid-pressure lifting cylinder is secured upon a bed or carriage provided with wheels, which are mounted on rails, arranged parallel with the axes of the rolls of the feed-table. The back-and-forth movement of this carriage is effected by means of fluid-pressure cylinder or cylinders, having their piston or ram connected by links to the carriage and preferably to the bearings of the shaft, such connection being effected by a cross-bar bolted to the bearings and pivotally connected to links. The ram or piston of the cylinder is connected by links to an arm secured to the shaft, and on the latter are also secured the arms having their outer ends pivotally connected to the lifting head or frame, which consists of vertical sections held together by a bolt and suitably spaced by blocks. The outer ends of the arms are pivotally secured within slots in the lower ends of the vertical portions of the lifting-head, so that when the arms are vibrated up and down by the shaft a corresponding up-and-down movement will be imparted to the head. As the connection between the head and the lifting-arms is pivotal, the head would be free to turn on the pivots, as they are in line with each other. Such turning movement, however, is prevented by means of a link connected to an extension from the lower end of the middle vertical section, and having its opposite end pivotally connected to the carriage. The point of connection with the carriage should, in order that the head may move up vertically in a direct line, be arranged in a vertical plane passing through the axis of the shaft. In the construction shown the anchorage for the inner end of the link is formed by a lug, formed on or secured to the bed-plate or carriage, and is connected to the inner end of the link by a bolt whose axis lies in a vertical plane passing through the axis of the shaft. This construction insures the practically straight-line movement in a vertical plane of all portions of the lifting-head of the manipulator.

One point to be noted in connection with this manipulator is that the severe strains on the fingers would be rather hard on the crank-shaft and its bearings. It would also be necessary to guard against the tipping of the trolley under the leverage brought to bear by the weight of the ingot on the fingers, together with the weight of the fingers and arms. This could be overcome, however, by removing the wheels and substituting cross-heads with hold-down guides on the upper sides.



KELLER INGOT MANIPULATOR.

The Caledonia iron mines, near Gouverneur, N. Y., will open this week and run full handed for an indefinite period. The ore is low grade, and when the price of ore fell in 1893, the mine could not be operated at a profit and was closed. There are three shafts on the property. Wells & Westbrook, of Ogdensburg, owners of the mine, had it pumped out last winter, expecting to sell. The sale was not effected, and two of the shafts were allowed to fill with water. Now every available miner will be employed.

The February number of *Scribner's* presents the fourth installment of Henry Norman's Russia of Today, in which he describes the region of Central Asia opened up by the Trans-Caspian railroad. Contemporaneous events in China are described by Thos. F. Millard.

Contrary to recent reports, the consolidation of the tin can manufacturers now seems more likely to be put through. The deal may be closed several weeks before April 1, on which date the options given by the various manufacturers expire. The capitalization of the new company is still secret, but a figure as high as $50,000,000 has been named. The consolidation will be closely allied with the American Tin Plate Co., and will take in nearly every can factory of importance in the United States.

DeCamp Brothers & Yule, Union Trust Bldg., St. Louis, have been appointed exclusive agents in St. Louis territory for the sale of Dayton pig iron.

The annual meeting of the stockholders of the Wheeling Mold & Foundry Co., of Wheeling, W. Va., was held last week and the board of directors, consisting of A. G. Hubbard, C. E. Blue, W. B. Jones, W. Z. Hoge and L. D. Blue, was re-elected. Contracts for the new plant proposed will be let within a few weeks.

It is reported that Charles R. Flint visited Richmond, Va., recently to inspect the plant of the Prigg Shipbuilding Co. of that city, with a view of negotiating for the purchase of the property. It is known that Mr. Flint has been making efforts to effect a combination of large American shipyards. The stock of the company, if formed, will be $60,000,000.

As a result of the meeting of the Mahoning and Shenango Bessemer Association, held recently in Cleveland, a letter was sent to the several railroads urging lower freight rates on ore and coke. Furnacemen declare some relief must be had.

THE FOUNDRY TRADE IN 1900.

At the beginning of last year the demand upon the foundries of the country was something unprecedented, in a decade at least. Manufacturing concerns were clamoring for the delivery of castings at a rate which forced an almost universal enlargement of foundry plants. The difficulty of procuring castings promptly led many manufacturers to establish foundries in connection with their own works. It must be remarked here that the advanced prices of castings also had something to do with the building of foundries by the users of castings. Those familiar with the trade know that competition and lack of orders had forced the price of castings to a point where only the well equipped shop, with careful management, could make a fair profit. With full order books it was naturally to be expected that the price of castings should increase, even if no advance had occurred in the cost of iron, coke and labor. Coupled with the latter, the sharp advance in the price of castings became the more pronounced by contrast with the figures of previous years, and more than one consumer of castings built a foundry because he thought that the foundrymen in general had conspired to tax him beyond the limit. It is unnecessary to say that this erroneous view of conditions over which the foundryman had no control, became apparent the minute these people put their own shops in operation when they learned that the cost of producing castings was greater than they, with their limited knowledge of foundry operations in general, had supposed.

Quite a few concerns who built shops of their own within the past eighteen months, are today buying castings in the open market and letting the foundry department of their works lie idle. They have learned in many instances that it is cheaper to buy castings than to make them.

Failures among foundrymen have indeed been few, especially so when we consider that great fluctuations in the cost of raw materials. For a presidential year there was very little interruption in the operations of plants.

We referred at the beginning of this article to the great demand for castings at the beginning of 1900, and believe it is worthy of mention that many of the consumers who were calling most loudly for the rapid delivery of castings were actually storing a large percentage of these away for future use. This policy began to reflect itself in the early part of the year, when contracts were not renewed with their usual regularity.

The spirit of consolidation, which has been so rampant in this country during the past two years, has not been without effect on the foundries. It is to be noted that all of the combinations touching the trade are in special lines, and that the chief object of their organization has been to decrease the cost of their product through abolishing separate officials for each plant and the maintenance of individual agencies. None of these consolidated companies can in any way be considered as a trust, as far as the foundry business is concerned, for anyone having sufficient capital can manufacture the same product as they do. Great benefit is derived from a consolidation of plants in the distribution of the finished product which can be delivered from the nearest plant. It should not be forgotten either that the manufacturing end is also brought to a higher standard, for the methods in vogue at the best managed branch must, in the natural course of events, be transmitted to the balance.

There is another feature wherein the consolidation of a number of plants has proved advantageous. In the handling of labor, if demands should be made which could not be granted, the closing down of one plant altogether would not, except in times of great activity, materially affect the volume of the manufactured product. A strike under such conditions is much less far-reaching in its consequences than would be the case were each plant under individual management.

Among the consolidations which affect the foundry trade may be mentioned the American Bridge Co., the American Car & Foundry Co., the American Radiator Co., the American School Furniture Co., the American Shipbuilding Co., the Central Foundry Co., the International Steam Pump Co., the Magnus Metal Co., the Niles-Bement-Pond Co., the Pittsburg Stove & Range Co., the Pittsburg Valve, Foundry & Construction Co., the Standard Sanitary Mfg. Co., and the United States Cast Iron Pipe & Foundry Co.—[The Foundry.

AMERICAN STEEL & WIRE CO.

In addition to the financial statement of the American Steel & Wire Co., printed last week, the following from the annual report is of interest:

"When we issued to you our first annual statement, one year ago, the outlook for the immediate future as to prices and volume of business warranted the prediction of a most prosperous year, but much to the disappointment of all, the volume of business in the first quarter of the year proved to be only one-half what was anticipated, and the result was an accumulation of stock so heavy that in April it was found necessary to very largely reduce our prices and close, for a time, several of our mills, that our accumulated stocks might be worked off. As our company was then a large buyer of both pig iron and billets, we necessarily had on hand and under contract a very large tonnage upon which the company was obliged to stand a large shrinkage in values when the price of Bessemer pig iron and of steel billets declined fully fifty per cent.

"Fortunately the volume of business for the last six months gradually increased, and we have been able to work off this overstock, and we enter the new year with all old stocks cleared away and our order books well filled with business at very satisfactory prices. The outlook for the coming year is certainly favorable, and as prices are now upon a normal level we have no reason to fear a repetition of last year's experiences. We are now producing nearly all of our requirements in pig iron and billets, and so are no longer subject to fluctuations in the prices of our raw materials.

"Our net profits for the year ending December 31, 1900, were $7,002,129.14, after marking off for depreciation $1,000,000 and expending large sums in maintenance and improvements and marking down all inventories as required by the market prices of December 31, 1900. While this amount is considerably less than our earnings for the year ending December 31, 1899, we are inclined to believe that when the changed conditions of the market are taken into consideration our stockholders will feel well satisfied with the results shown.

"As the company is now the owner of iron ore mines on Lake Superior it was deemed necessary by the board of directors that we also become independent of possible freight combinations in transporting ore to our furnaces, and, looking to this end, the directors have negotiated for the purchase from the American Steamship Co. of twelve large steel boats of a capacity sufficient to carry practically all of the ore used by this company. This purchase was made by the guarantee on the part of the American Steel & Wire Co. of 20-year five per cent sinking fund bonds to the amount of $5,630,000 (this being the entire purchase price), secured by a mortgage on the boats purchased. Based upon the average lake freight rates for the past ten years, we predict that this fleet of twelve steamers will earn annually at least sufficient to pay the interest upon the bonds and provide for a sinking fund sufficient to retire all of these bonds before maturity, thus leaving the American Steel & Wire Co. the owner of the entire fleet, free from incumbrance and without the investment of one dollar."

Bridge Work at Chicago.

Contracts for the construction of bascule bridges across the Chicago River at Ashland Ave. and Canal and Main streets, Chicago, were awarded last week by the Drainage Canal trustees. Work on two of the bridges will be commenced at once, but that at Canal St. may be delayed somewhat. The contracts for the bridges at Canal and Main streets were let to the American Bridge Co., the Massillon Bridge Co. securing the contract for the Ashland Ave. bridge. All of the bridges will be of the bascule type, allowing the full width of the spans for the passage of vessels. The spans will be 140 feet long in each case. The contract prices for the bridges were as follows: Canal St., American Bridge Co., superstructure, $71,100; Lydon & Drews Co., substructure, $53,914.30. Main St., American Bridge Co., superstructure, $72,800; Lydon & Drews Co., substructure, $51,913.45; Ashland Ave., Massillon Bridge Co., superstructure, $91,200; Page & Schnable, substructure, $35,542.45. The Drainage Canal Commission now has at work a board of engineers preparing a comprehensive plan of improvement for the Chicago River. This plan, when completed, will call for the erection of a great many new bridges of the lift or bascule type, to take the places of the old draw bridges.

RECEIVED FROM THE TRADE.

Hot Blast Stoves.—The C. H. Foote hot blast stove, of which David Lamond, Pittsburg, is agent, is described and illustrated in section in a recent pamphlet. The patentee of this stove found that in considering the cost and number of bricks in each stove the heating surface could be increased, thereby reducing the cost per foot of heating surface. He found that this could only be done in the checker or regenerative part, because to reduce the area of the combustion chamber for the purpose of gaining heating surface would be a vital mistake, as the gases must have room to expand. The Foote stove is the outcome of these and additional discoveries. For a series of stoves, either one single chimney or separate chimneys can be used. A comparison with other stoves shows that the heating surface per thousand brick is from 28 to 42 per cent more, and consequently the number of bricks is proportionately less, thereby reducing the cost per foot of heating surface.

Air Compressors.—In its eleventh complete catalogue, the Clayton Air Compressor Works, New York City, claims for its air compressors simplicity of design, economy in consumption of power, efficiency in air compression, accessibility and durability of working parts and perfect automatic regulation. The company has had 30 years of experience in the manufacture of air-compressing machinery. The catalogue is thoroughly illustrated and detailed descriptions are given. Clayton vacuuum pumps are treated in detail. A useful index precedes the descriptive matter. Among other contents is full information relative to the transmission of compressed air and capacity lost by air compressors in operation at various altitudes.

Iron and Steel.—The Republic Iron & Steel Co. has sent out its 1901 catalogue and price list, superseding all previous issues. The catalogue is fully indexed and covers all the various products of the company. A list of the 24 different plants is given. The standard specifications governing the chemical and physical properties of structural and special open-hearth plate and rivet steel as adopted by the Association of American Steel Manufacturers is given complete. The section on the bolt and nut department is particularly full. The latter portion of the book is occupied with a number of lithographs of special shapes and sections made by the company. The binding is full flexible leather, embossed.

Foundry Supplies.—F. B. Stevens, Detroit, Mich., in a catalogue, which in appearance calls to mind the old-time chap books, advertises his general foundry supplies. The volume is decidedly unique and artistic throughout. The front cover is a poster design, having a representation of a chimney, and labeled "Sign of big chimney." The explanatory remarks state that the catalogue is made of size convenient for the hip pocket. There is information concerning pig iron, softeners, cupolas, fire brick, etc., all couched in serio-quizzical language. The book is a valuable aid to founders in ordering foundry supplies, containing full lists and many illustrations, with descriptions and data.

Wagon Hardware.—The Cleveland Hardware Co., Cleveland, O., presents an excellent half-tone of its works on a single sheet of heavy super-calendared paper.

Announcement was made last week that the mills of the Oliver Iron & Steel Co. in Pittsburg and the Lindsay & McCutcheon mill of the American Steel Hoop Co. in Allegheny have been declared open by the Amalgamated Association of Iron, Steel and Tin Workers of America for the purpose of organizing a lodge in each, with a view to unionizing them. This is the first step taken to unionize the non-union mills both in the Pittsburg and other districts where the association is weak. A meeting of the sheet workers of the country was also held in Pittsburg last week for the purpose of deciding upon some plan by which they can unionize the non-union mills of the American Sheet Steel Co. Of the 167 mills operated by this company 104 are union and 63 non-union.

Breitweiser & Co., of Pittsburg, have been awarded the contract for the construction of a building 400x80 feet to be built for the Carroll-Porter Boiler and Tank Co., of Wellsville, O.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:

The Sarfert Co. has been granted a New Jersey charter, with a capital of $100,000, for the manufacture of machinery. Max Sarfert, William C. Wedersein and C. Hayward Fairbanks are the incorporators. An office has been established at Trenton, N. J.

The Quincy Engine Co., of Quincy, Ill., has been incorporated with a capital of $250,000 to manufacture machinery, tools, engines, motors and appliances. Thomas Hill, William H. Govert and P. B. Williams are the incorporators.

The William J. Broatch Iron Co., of Omaha, Ia., has been incorporated with a capital of $100,000. The incorporators are William J. Broatch, John W. McDonald and J. E. Marsh.

The Dyler Plow Co., Akron, O., capitalized at $50,000, has been incorporated by John Immel, Fred E. Koerschner, Wm. R. Dyler, Geo. Doll and A. H. Cummins. The company will manufacture plows and cultivators.

John C. Devine, Alliance, O., is in the market for a new or second-hand 80-horsepower boiler.

The Southern Engine & Boiler Works, Jackson, Tenn., will install a cupola, two 2-ton electric traveling cranes and jib cranes for foundry.

E. E. Sanford, Milan, Tenn., is in the market for an engine lathe.

A new company has been formed to erect a foundry in Youngstown, O. It will be the largest jobbing foundry plant in the Mahoning or Shenango Valley. Youngstown capital is interested.

The Maryland Metallic Bed Co., Baltimore, Md., recently organized, will establish a factory for iron and brass beds, with capacity of 100 per day, at a cost of $30,000 to $40,000 when equipped.

J. C. Womble, N. J. Verrett, C. H. Ross and H. N. Samstag have incorporated the Verrett Shaft Engine Co., Little Rock, Ark., with a capital stock of $100,000.

The Conie Stove Co., Junction, Ark., has been incorporated, with capital stock of $20,000, by J. D. Proctor, president; Thomas Robertson, vice-president, and R. G. Brown, secretary and treasurer.

The Camden Machinery & Supply Co., Camden, Ark., has been incorporated with capital of $50,000 by C. C. Rose, president; J. B. McCaughey, C. B. Benson and others.

The new firm of Ragatz & Scharttgen, Dubuque, Iowa, have built a machine shop on Washington street, which they are equipping with machinery and tools of the latest design for machine repairs.

The Penn Shovel Co., Corry, Pa., incorporated December 20, 1900, for the manufacture of shovels, has its building about completed, and hopes to have machinery installed to commence operations by March 1.

E. C. Hampeter, St. Louis, who recently resigned from the management of the Tudor Works, East St. Louis, of the Republic Iron & Steel Co., has secured the factory buildings formerly used by the St. Louis Stamping Co., of the National Enameling & Stamping Co. He will erect an iron foundry which will be equipped with a Whiting cupola. Crocker-Wheeler motors will be used throughout the works. A general line of iron and brass beds and springs will be made.

Lindsey Kelly, Ironton, O., has purchased Centre Furnace from Mrs. Lindsey Kelly for $30,000. Preparations are now under way for putting the furnace in blast, and under Mr. Kelly's management 100 tons of charcoal iron will be produced per week.

Ward Baldwin, Mitchell Building, Cincinnati, O., will open proposals Feb. 11 for steel structure and foundry building complete; specifications sent on application.

Union Iron Works Co., Selma, Ala., is in the market for a light car-wheel borer, with universal chuck, to take wheels up to twenty-six inches in diameter, new or second-hand.

Peacock's Iron Works, Selma, Ala., wants dealers' prices on a small 6-h. p. high-speed engine for driving a dynamo.

The Chickamauga Car Manufacturing Co., Chattanooga, Tenn., has been chartered at Nashville, Tenn., with capital

stock at $50,000, by W. H. Payne, Jr., Edward J. Nolan, J. P. Penberton and others.

The Norfolk Cutlery Co., Norfolk, has been incorporated, with capital sock of $25,000 to $50,000, for the manufacture of cutlery and silver-plated ware. R. B. Fentress is president; S. Q. Collins, vice-president, and B. W. Leigh, secretary and treasurer. It is reported that this company, formerly the Bridgeport Silver Plating Works, will begin operations at once.

Fires and Accidents:—

The Bessemer plant of the Republic Iron & Steel Co., at Youngstown, O., was compelled to shut down on Jan. 29, because of the collapsing of the large engine in the blooming mill. The accident will tie up the plant for about two weeks.

New Construction:—

The American Sheet Steel Co. has issued orders for the erection of two additional sheet mills at its Struthers, O., plant.

It is reported that the Oil Well Supply Co. of Pittsburg will erect a $20,000 machine shop at Florence, Colo.

The Norton Iron & Steel Co. of Ashland, Ky., will add a plant for the manufacture of wire and wire nails. The addition will cost about $40,000 and will be paid out of the net earnings for the past six months.

The Grand Rapids Malleable Iron Co. of Grand Rapids, Mich., will enlarge its plant in the spring.

The East End Forge & Machine Works, East Liverpool, O., will erect an addition to its plant.

Sealed proposals will be received by Ward Baldwin, Mitchell building, Cincinnati, O., until Feb. 11, for steel structure and foundry complete for Lane & Bodley Co.

The new shops to be erected by the Lake Shore & Michigan Southern in Collinwood, O., will cost about $1,000,000. They include a machine shop 530x240 ft., storehouse 60x300 ft., power house 85x116 ft., paint shop 335x160 ft., coach shop 335x110 ft., freight repair shop 335x110 ft., and also a brass foundry, blacksmith shop, boiler house, etc. The buildings will be of brick, with steel frames.

The W. J. Loth Stove Co., Waynesboro, Va., has commenced erection of proposed foundry building for doubling capacity of its stove works.

The Norwood Engineering Co,. Florence, Mass., pattern makers and foundry and general machine work, is building an extension to its machine shop of about 100 ft., and an addition to its foundry.

The Carroll-Porter Boiler & Tank Co., Pitsburg, has broken ground for the erection of its new shops at Wellsville, O. In addition to doing a general line of structural iron and steel work the company will also build steel barges.

The Columbus Chain Co., Columbus, O., in order to keep pace with its increasing business, has decided to enlarge its plant in the South End by 15 fires, giving employment to 25 more men. The present plant operates 45 fires.

A galvanizing department is to be added to the E. A. Henry wire plant at Cuyahoga Falls, O.

It is reported that a 10-inch mill will be added to the plant of the Canton Steel Co., at Canton, O.

The Pittsburg Stove and Range Co., Pittsburg, will turn its foundry, known as Foundry F, formerly operated by Bissell & Co., Allegheny, into a warehouse. The new building will be 110x120 ft., and will be of brick and two stories high.

The rolling mill of the Ohio Rolling Mill Co., Findlay, O., manufacturers of bar iron, will be enlarged in the spring by the addition of another train of rolls. This will necessitate the installing of another engine also to furnish power.

The Mahoning Foundry & Machine Co., Youngstown, O., has selected a site for the new plant which is to be built in the spring. The building will be of steel. It is the intention of the company to install two cupolas, one large and one small, in the foundry. A 25-ton electric traveling crane and a 5-ton auxiliary hoist will be placed in the machine shop, with a 47-inch planer, 24-inch planer, 86-inch engine lathe, milling machine and key-seater, with the machinery equipment in the present plant. The company is considering the question of using gas engines instead of steam in both foundry and machine shops. If gas engines are decided upon an engine of 100 h. p. will be bought. All the machinery is to be electrically driven.

The D. Clint Prescott Co., Menominee, Mich., manufacturer of sawmill machinery, is building a 50x70 foot addition to its main shop. An addition to the fonudry is about completed. The company has plans, the materialization of which will greatly increase capacity and facilitate the handling of work. A new brick boiler house will supplant the wooden structure, soon to be dismantled. A new engine and boiler of nearly 100 h. p. will be purchased at once, and will furnish a third more power. A new planer has been put in, which is one of the largest planers in use in the northwest. A new traveling crane will be put in place soon, together with other machinery. These improvements will cost several thousand dollars. The company has so many orders on hand for both new machinery and extensive repairs that this increase of capacity is necessitated.

The Pittsburg District:—

The new plant of the Union Steel Co. at Denora, Pa., is fast nearing completion. The large buildings of the plant, three in number, are practically completed, and a large amount of machinery has already been installed. Only two more buildings remain to be put up, an engine house and a pump house. The large buildings are each 780 feet long, two are 200 feet wide and the other 120 feet. The company lately drilled in a gas well near the works and will shortly drill another, as gas will be the fuel that will be used in the operation of the plant. It is believed that operations can be commenced in May.

The Sharon Tin Plate Co., of Sharon, Pa., has awarded a contract to the Diamond Drill co., of Birdsboro, Pa., for several tin plate mills, squaring and doubling shears and other machinery. The contract amounts to about $50,000.

Plans for the new plant of the Lewis Foundry & Machine Co., which is to be erected near Coraopolis, Pa., on the Ohio river, are nearing completion. Work on the plant will be commenced in the spring.

The Carnegie Steel Co. one day last week shipped 80 cars of steel plates from its Homestead plant to McKees Rocks for the Pressed Steel Car Co. This is one of the largest shipments of plates made for some time.

The Pressed Steel Car Co., of Pittsburg, will rebuild its plant at Joliet, Ill., recently destroyed by fire. The shops are being rebuilt with a view of devoting them exclusively to the manufacture of body and truck bolsters, and they will have a capacity of about 400 bolsters a day. The new main building of the plant will be of stone, 340x80 feet, with a wing 280x30 feet.

The American Bridge Co. last week awarded a contract for the erection of a three-story office building to be erected at Butler and Fifty-first streets, in Pittsburg. The building will be 225 feet long and 42 feet wide. The company proposes to consolidate all its offices in the Pittsburg district in this building. The two upper floors will be used for draughting purposes, with accommodations for 200 draughtsmen.

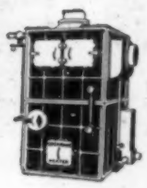
The McClintic-Marshall Construction Co., of Pittsburg, has been awarded the contract for the erection of the addition to the tin mill of the Sharon Tin Plate Co., at Sharon, Pa.

The Vulcanus Forging Co., of Cleveland, is pushing its plant to its utmost capacity. Some relief will be secured by an addition to the plant which will be erected in the coming spring. Recent orders included a contract for 27,000 lag screws and one for 15,000 lag screws, all for government work. The company has just shipped a carload of ¾-inch rivets to Chicago, a carload of air brake pins and 122 tons of truss and bridge rods. A considerable order for forgings for a Northern Ohio concern has also been booked. Among recent machinery added are 4-inch bolt cutters manufactured by the Reliance Machine & Tool Co., of Cleveland.

The Marshall-McClintic Construction Co., Pittsburg, has been awarded the contract for a $300,000 addition to the Sharon Tin Plate Co.'s plant. The same company is building the present mill.

The national officers of the Amalgamated Association are investigating the report of the puddlers in the Sligo mill of A. M. Byers & Co., Pittsburg, to the ffect that the company wants them to work six heats per turn, while the rules of the association permit but five. They have quit work. The

Cochrane Feed-Water Heaters.



It is a pleasure to us to quote prices on **Cochrane Heaters**, not so much because we hope and expect to get the order, and from the profit thereon pay some portion of what it costs us to live, but because we have the feeling that the price is **right**, that we are undertaking to furnish an apparatus well worth the money from manufacturing and commercial standpoints, and that this apparatus is going to prove a money saver, a labor saver, and a most profitable investment for any steam power plant.

We also know in advance that if our proposition receives favorable consideration, and if the Heater is installed under anything like normal conditions, that the buyer will be perfectly satisfied with the transaction, and glad that he chose the **"Cochrane."**

Every little detail that enters into the design and construction of a Heater that shall be first class in every particular, thoroughly reliable, durable and easy to operate, has received most careful attention.

We are making and selling heaters that are heaters in every sense of the term. Would like to make one for you.

Harrison Safety Boiler Works, Clearfield & Seventeenth Streets, PHILADELPHIA, PA.

company claims that the puddlers at other plants work six heats to the turn.

The National Tube Co., Pittsburg, filled an order recently for 15 miles of 6-inch pipe on short notice. The pipe was destined for Beaumont, Texas, and was first shipped to Cincinnati and then transferred to the Queen & Crescent route, and on a specially fast schedule was hurried to New Orleans. The shortest route to the new oil field in Texas is via Cincinnati and New Orleans.

Chicago District and Northwest:—

The Fort Wayne Foundry & Machine Works, Rookery, Chicago, will remove from the present location at Forty-seventh street and Wentworth avenue, Chicago, to Forty-third street, west of Ashland avenue, on property owned by the Chicago Junction Railway Co. The main building of the plant is 475 feet long and of steel construction, and can be removed to the new location.

Plans have been completed for the one-story frame building bridge shop which the Morava Construction Co., 1243 Marquette building, Chicago, will erect at Eighty-fifth street and Stewart avenue, at a cost of $16,000.

William T. Branitsky, architect, 167 Dearborn street, Chicago, is making plans for a brick machine shop, three stories high, 62x60 feet in size, to cost $7,000, to be erected on Nineteenth street, near Rockwell street. It will be of mill construction, and the plans provide for machinery, iron work, steel girders and vaults.

Figures are being taken on the new foundry of the Franklin Foundry Co., Chicago, which is to be erected at 1155 South Paulina street. It will be one story, 66x120 feet in size, of heavy mill construction with frame exterior covered with corrugated iron. A cupola room will be 26x24 feet. The cost of the plant is estimated at $4,000.

Plans have been made for a machine shop for the Luther-Geis Co., Milwaukee, Wis., to cost $5,000.

The Crescent Foundry Co., St. Louis, Mo., will erect a foundry 75x150 feet in size, one story high, of frame and brick construction. The equipment, besides foundry equipment, will include an electric dynamo, a 70 horsepower boiler, 50 horsepower engine and steam pump. The cost will be $15,000.

At the annual meeting of the Maywood Foundry & Machine Co., Manadnock Block, Chicago, held Jan. 29, the capital stock of the company was increased from $75,000 to $100,000. This was necessitated by the large increase in the company's business, entailing a very considerable addition to its plant. The company's works are now running day and night on accumulated orders. The following officers were elected at the meeting: President, F. E. Lonas; vice president, I. L. McCord; secretary, H. W. Boies; superintendent, O. H. Davison.

The Scully Steel & Iron Co., of Chicago, has just closed a contract for export of plate steel, structural steel, rivets, sheet copper and machinery amounting to $250,000.

General Industrial Notes:—

Buffalo dispatches report the discontinuance of two suits brought by the Buffalo Furnace Co. against the Butler-Pierce Manufacturing Co., Syracuse, N. Y., one in the United States Circuit Court for $35,000 damages, and the other in the Supreme Court for $23,000 additional damages. The plaintiff alleged that the defendant had failed to accept 1,500 tons of foundry iron, because the price dropped after the order was placed. An agreement was made whereby the defendant company will take this iron and 6,000 tons additional.

The Cooper Machine Co., engineers, founders and machinists, Saltsburg, Pa., is running full with many orders on hand. The company builds power plants, gas and gasoline engines, friction clutches, and also takes contracts for general and special machinery castings in iron, brass and bronze.

The Ludlow-Saylor Wire Co., St. Louis, on Jan. 23, voted to increase its capital stock from $100,000 to $400,000. This company has lately erected an extensive factory on Newstead avenue and the Wabash tracks, and is now actively engaged in turning out its full line of perfect double-crimped wire cloth in brass, steel and copper. This factory is in addition to the company's original plant at Fourth and Elm sts., St. Louis.

The Spearman Iron Co., operating Spearman Furnace, at Sharpsville, Pa., have elected the following directors: J. J. Spearman, H. H. Henderson, Jos. Foraker, John Phillips and

The Robert Field Company,

20 Hayden Building, COLUMBUS, OHIO.

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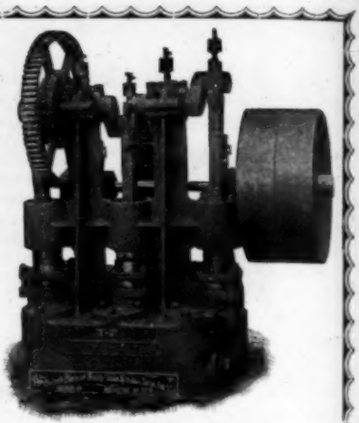

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The Stillwell-Bierce & Smith-Vaile Co., 227 Lehman Street, DAYTON, OHIO, U. S. A.

Miss Alice Pierce. J. J. Spearman is president of the company. M. A. Hanna of Cleveland, has sold his interest in the concern.

The Claire furnace of the Claire Furnace Co., and the Alice furnace of Pickands, Mather & Co., both at Sharpsville, Pa., will blow in shortly.

No. 2 stack of the Pioneer group of the Republic Iron & Steel Co., at Thomas, Ala., has won the record from Southern furnaces in the production of foundry iron by turning out 220 tons.

At a meeting of the board of directors of the Youngstown Iron Sheet & Tube Co., Youngstown, O., held Feb. 2, it was decided to enter into negotiations with the owners for the purchase of the Perrins process of tube making. A site for the new plant has not yet been selected, pending an agreement with the four railroads interested.

Fav & Scott, Dexter, Me., manufacturers of machine tools, have been incorporated as a stock company by the original firm, Fay & Scott, transferring all real estate, personal property and accounts to the new corporation, which is a close corporation, the stock being held only by N. H. Fay, W. L. Fay and Marion E. Fay. No change in the line of business, buildings or management will be made.

The William A. Harris Steam Engine Co., Providence, R. I., manufacturer of the Harris-Corliss engines, has reorganized and the plant has been conveyed to it by the assignees. The officers of the company are Frederick A. W. Harris, president and general manager; William A. Harris, Jr., vice-president and superintendent; E. Francis Crowell, secretary and treasurer.

The Aurora Boiler Works, of Aurora, Ill., recently shipped four boilers, aggregating 1,090 horsepower to the Illinois Sugar Refining Co.

The annual meeting of the stockholders of the Niles Tool Works, of Niles, O., was held last week. Directors were re-elected as follows: Alexander Gordon, M. T. Watts, J. D. Parker, George T. Reiss and W. E. Hall. Alexander Gordon was elected president; J. D. Parker, vice president; M. T. Watts, secretary, and James Cullen, treasurer. An excellent financial showing was made.

The Pennsylvania Steel Co., of Steelton, Pa., recently received an order for 300 tons of rails from the Chattanooga Railway Co.

The plant of the Hardie-Tynes Machine and Foundry Co., recently destroyed by fire, will be rebuilt at Birmingham, Ala.

The Gadsden furnace of the Alabama Consolidated Coal & Iron Co. at Gadsden, Ala., will shortly be put into blast.

Owing to the scarcity of material several departments of the Youngstown, O., plant of the American Bridge Co. have suspended operations.

Operations at the Benwood plant of the National Tube Co., at Benwood, W. Va., will be resumed next week. A settlement has been made with the puddlers.

At the annual meeting of the stockholders of the Union Iron Works, of San Francisco, Cal., held last week, the following were elected directors for the ensuing year: Irving M. Scott, Henry T. Scott, J. O'B. Gunn, G. W. Dickie, P. N. Lilienthal, George W. Prescott, E. L. Griffith. At a meeting of the directors held subsequently the following officers were chosen: President and treasurer, Henry T. Scott; vice president and general manager, Irving M. Scott; secretary, J. O'B. Gunn; manager, G. W. Dickie.

The Pennsylvania Steel Co. expects to have secured consent to its organization of practically all its stockholders by the end of the present month. The following figures as officially given, show the charges ahead of the preferred stock in the present company in contrast with charges under the proposed new company, the figures first given in each case being for the present company: Interest on first mortgage, $150,000, $150,000; interest on consolidated mortgage, $210,000, $90,000;

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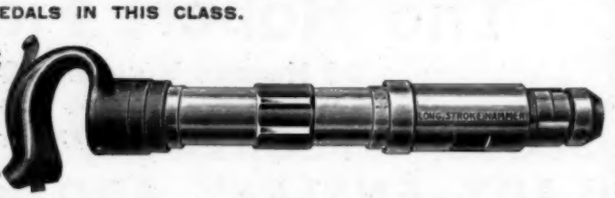

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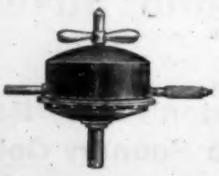

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interest on floating debt, $67,000, none; giving total charges ahead of preferred stock, $427,000, $240,000; dividend on preferred stock, $105,000, $1,155,000; giving total charges ahead of common stock, $532,000, $1,395,000. The amount which would have been saved to the company in 1900 and in 1901 had the new capital been available and invested in properties supplying coke and ore are as follows: Saving on ore, 1900, $1,603,400; 1901, $942,000; saving on coke, 1900, $1,304,400; 1901, $434,000; giving totals for 1900, $2,907,800 and for 1901, $1,376,000. The prices which the company had to pay in 1900 in the open market for its supplies of coke and ore were abnormally high, since 1900 was a year in which prices were on an extremely high level, and, therefore, the saving which the company would have been able to make in that year is beyond what would be shown in an average year. In 1901 prices of coke and ore are about what may be expected in normal years, and the saving alone is enough to pay all fixed charges of the new company and a full dividend on the new preferred stock.

Application has been made for the appointment of a receiver for the Rogers Locomotive Works, of Paterson, N. J. The concern has ceased to exist as the Rogers Locomotive Works, the directors becoming trustees. The works will be sold to the highest bidder as the law provides.

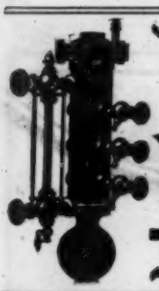
The new works of the Grant Tool Co., Franklin, Pa., successors to the Grant Machine Tool Works, Cleveland, will probably be started about May 1. Officers are: President, Charles Miller; vice-president, J. J. Grant; secretary, N. B. Davis.

The Empire Iron & Steel Co. has commenced the erection of an anthracite blast furnace at Reading, Pa., with a capacity of 1,000 tons a week.

The Hannah furnace at the valley mill will be lighted Feb. 9. Extensive improvements have been made. The Haselton stack now on foundry iron will be put on mill iron to accommodate the local mills, and the Hall stack, at Sharon, Pa., will be put on foundry.

M. W. Gardner has been appointed receiver for the Phenix Iron Foundry, Providence, R. I. The debts of the company aggregate about $80,000, and are thought to be more than covered by the assets.

During the month of January the Monongahela Furnaces,



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National Rolling Mill and the Boston Iron & Steel Works of the National Tube Co. at McKeesport, Pa., broke all previous records. The furnaces produced 23,670 tons 1,862 pounds, and the blooming and converting mills produced 26,041 tons 1,100 pounds. This exceeds all previous records by 1,100 tons.

Walsh & Weidner, of Chattanooga, Tenn., have been awarded the contract for the construction of fourteen 150 horsepower boilers for the Louisiana & Texas Lumber Co., of Texarkana, Tex. The company has also been awarded the contract for the erection of the furnace to be erected by the Roane Iron Co. at Rockwood, Tenn.

The Mesta Machine Co. has just completed a pair of blowing engines for the Illinois Steel Co. which are said to be the largest in the world. Each has a capacity of producing 45,000 horsepower, and weighs 400 tons. Work on the engines was commenced more than a year ago, and the first was completed early last month. The second pair of engines are now under construction and will shortly be completed. The company has also received an order for a complete slabbing mill for the Cambria Steel Co., at Johnstown, Pa.

The Edgar Thomson rail mill of the Carnegie Steel Co. is at present operating on an 8,000-ton order of "bull-head" rails for the Great Eastern Railway Co., of England.

During the month of January 10,230 tons of steel rods were produced at the Rankin plant of the American Steel & Wire Co. This record was made in 50 working turns.

The American Bridge Co. has received the contract from the Pittsburg & Lake Erie Railroad for the new steel bridge over the Monongahela river at Homestead, Pa.

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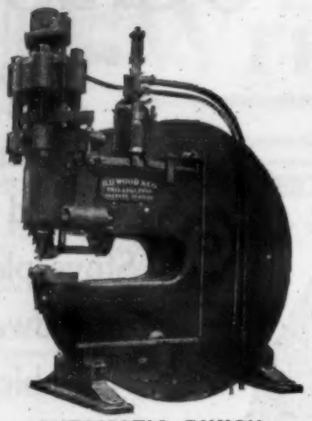

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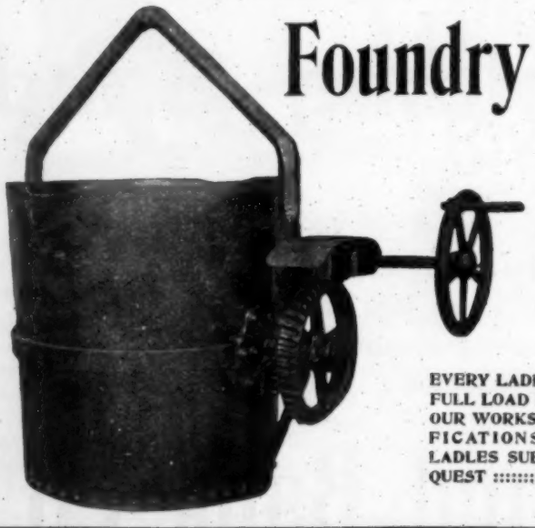

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Southbound, (down). (up). Northbound.
January, 1901.

15	13	11	Lorain Branch	10	14	16
P.M.	P.M.	A.M.		P.M.	A.M.	P.M.
4:00	1:05	7:00	Lorain	3:31	12:02	7:15
4:18	1:25	7:20	Elyria.....	3:14	11:45	6:59
4:36	1:53	7:43	Grafton	2:56	11:29	6:41
4:58	2:15	8:05	Lester Jun...	2:32	11:08	6:21

5	3	1	Main Line.	2	4	6
P.M.	P.M.	A.M.		A.M.	A.M	P.M.
5:10	1:35	7:50	Cleveland.....	9:50	12:00	6:00
6:20	2:31	8:27	Lester Jun...	8:48	11:07	5:00
6:31	2:40	8:36	Medina	8:36	10:59	4:48
6:54	2:59	8:57	Seville	8:14	10:40	4:26
7:00	3:04	9:03	Sterling	8:03	10:34	4:20
7:18	3:24	9:24	Warwick.....	7:41	10:13	3:56
7:30	3:32	9:31	Canal Fult'n	7:34	10:06	3:48
7:50	3:50	9:50	Ar. Dep. Massillon.	7:15 8 P.M.	9:50	3:30
7:50	3:50	9:50	Dep. Ar.	7:50	9:50	3:30
8:05	4:06	10:05	Justus.....	7:31	9:35	3:13
8:35	4:37	10:36	Canal Dover	7:03	9:05	2:44
8:42	4:44	10:43	New Phila....	6:55	8:58	2:37
9:00	5:01	11:00	Ar. Dep	6:38	8:40	2:20
7 A.M.			Urichsville			
7:30	5:10	11:10	Dep. Ar.	6:38	8:40	2:20
8:06	5:43	11:42	Freeport	6:00	8:06	1:44
		P.M.				
8:32	6:07	12:05	Flushing	5:34	7:42	1:20
9:40	7:05	1:05	Bridgeport...	4:30	6:45	12:20

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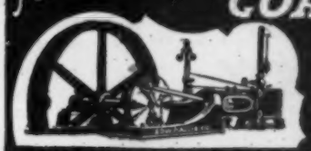

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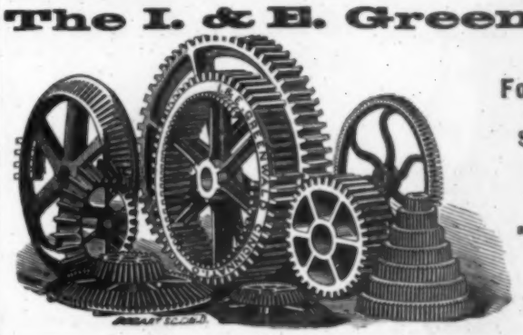

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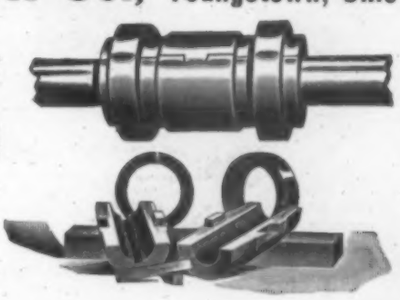

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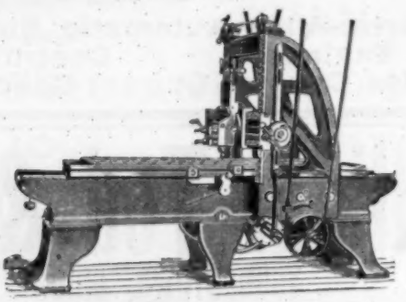

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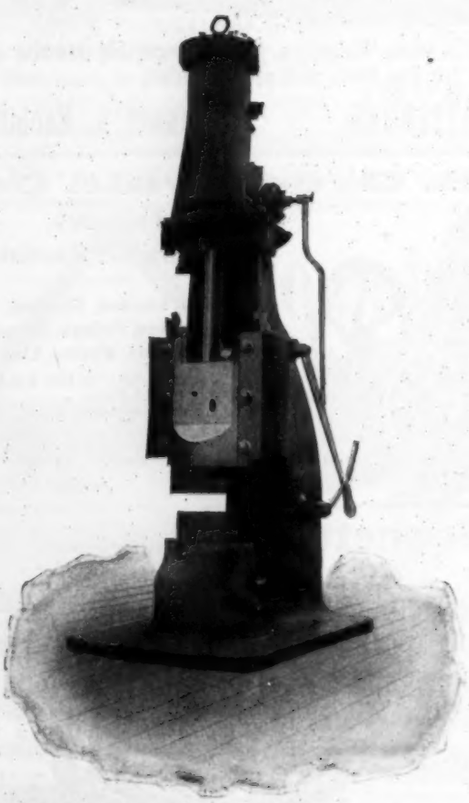

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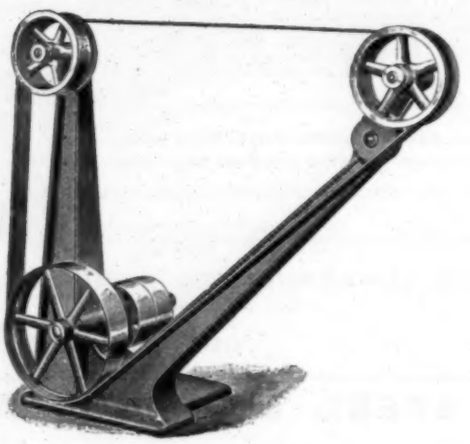

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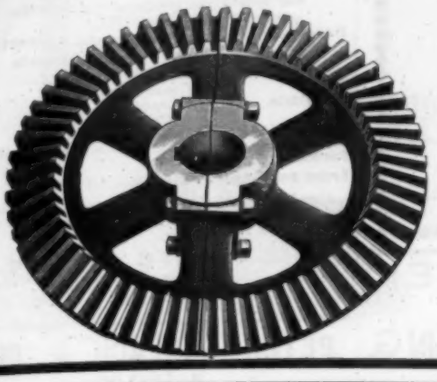

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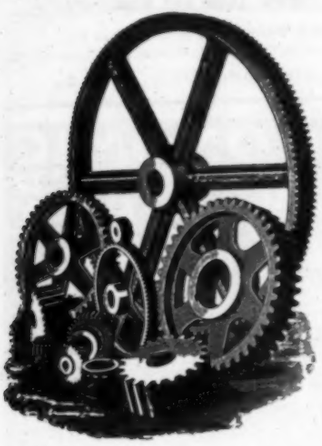

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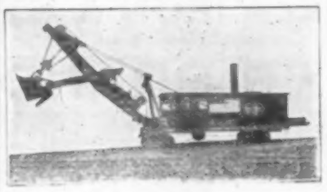

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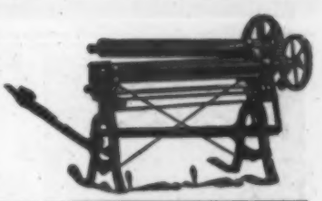

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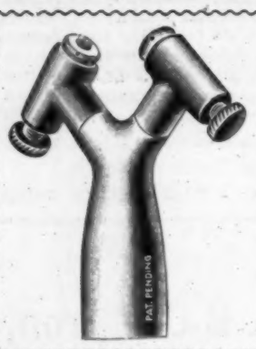

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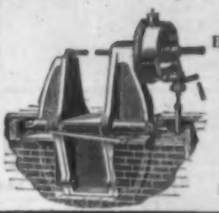

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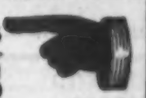

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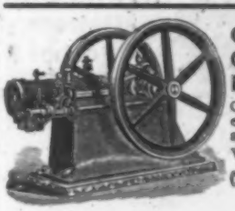

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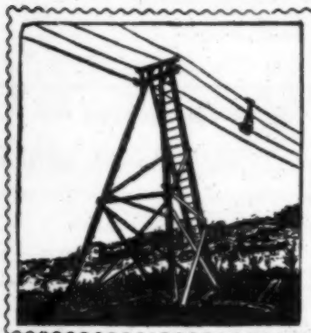

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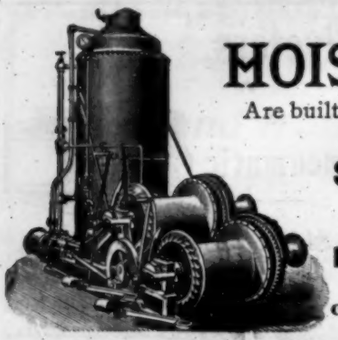

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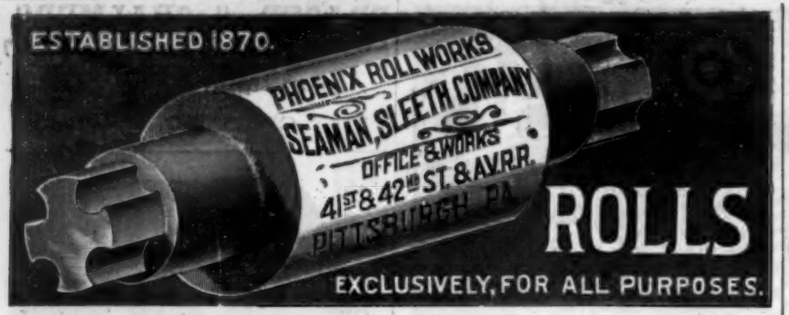

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"The present edition of the Supplement comprises 78 well printed pages and contains an authorized description of the organization of each of the thirty consolidations mentioned, giving its capitalization, list of officers, general office address and address in most instances of the district offices, and a list of properties owned or operated by it, with the names of previous owners of iron and steel works. The name and the character of every plant are fully stated. For detailed information concerning the plants mentioned and their products reference is given to the page or pages in the Directory in which they are fully described. Iron ore mines, coal mines, coke ovens, railroads, and lake vessels owned by the consolidated companies are also given in sufficient detail."

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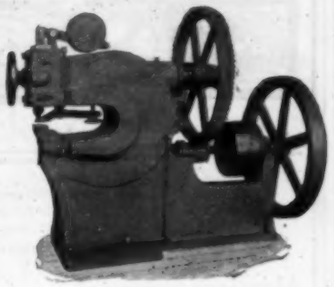

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The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition It contains a complete list of all the

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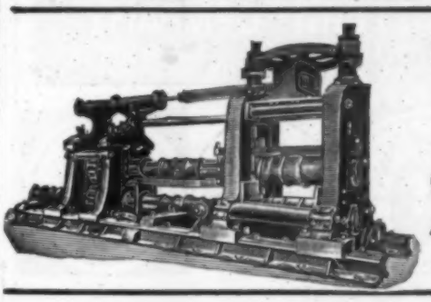

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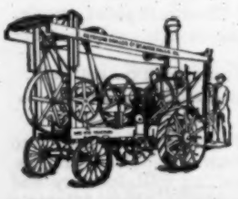
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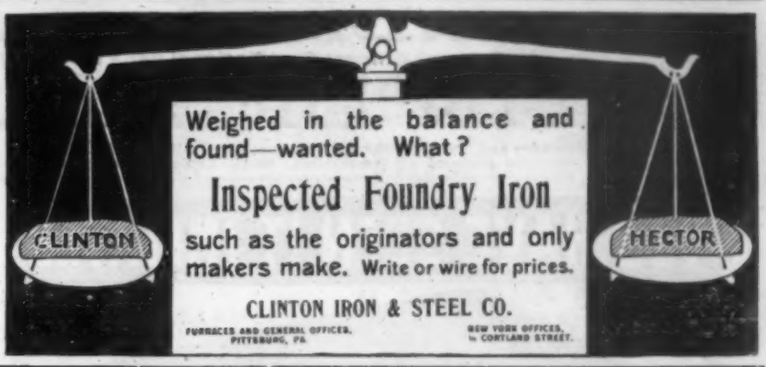
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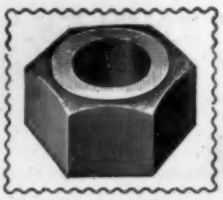

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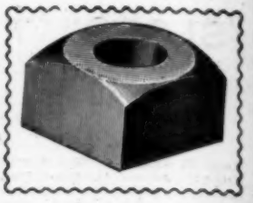

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The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

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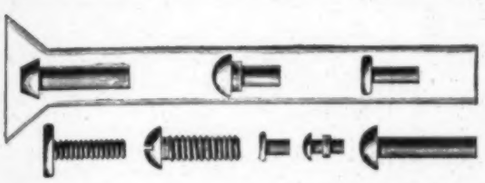

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Cleveland Punch & Shear Wks. Co., Cleveland.
Northern Engineering Works, Detroit, Mich.
S. Obermayer Co., Cincinnati, O., and Chicago.
Marion Steam Shovel Co., Marion, O.
Torbert & Peckham, Chicago, Ill.
R. D. Wood & Co., Philadelphia, Pa.
Wm. Tod & Co., Youngstown, O.

CRANES AND DERRICKS—
A. Leschen & Sons Rope Co., St. Louis, Mo.

CRANK PINS—
Bethlehem Steel Co., S. Bethlehem, Pa.

CRUSHING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

CUPOLAS—
Riter-Conley Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Wm. B. Pollock Co., Youngstown, O.
S. Obermayer Co., Cincinnati, O., and Chicago, Ill.
The United Boiler Co., Girard, O.

DECALCOMANIAS—
Scientific Manufacturing Co., Chicago, Ill.

DIES—
American Steel & Wire Co., Chicago, Ill.
Curtis & Curtis Co., Bridgeport, Conn.
Danielson Machine & Tool Co., Cleveland, O.

DIE STOCKS—
Curtis & Curtis Co., Bridgeport, Conn.

DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
The Jeffrey Mfg. Co., Columbus, O.
Thew Automatic Shovel Co., Lorain, O.

DRILL GRINDERS—
I. Wendell Cole, Columbus, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

DRILLING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.

DRILL PRESSES—
C. H. Besly & Co., Chicago, Ill.
Jos. E. Bissell, Agt. Prentiss Tool & Supply
U. Baird Machinery Co., Pittsburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

DROP FORGINGS—
E. D. Clapp Mfg. Co., Auburn, N. Y.
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Jas. H. Baker Mfg. Co., Pittsburg, Pa.
Frankford Steel & Forging Co., Philadelphia.
Wyman & Gordon, Worcester, Mass.

DROP HAMMERS—
Cleveland Punch & Shear Wks. Co., Cleveland.

DROP PRESSES—
Avery Stamping Co., Cleveland, O.
Bethlehem F'dry & Mach. Co., Bethlehem, Pa.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Cleveland Punch & Shear Wks. Co., Cleveland.
Danielson Machine & Tool Co., Cleveland, O.

DYNAMOS—
Jeffrey Mfg. Co., Columbus, O.

EAVE TROUGHS AND CONDUCTORS—
Berger Mfg. Co., Canton, O.

ELECTRICAL MACHINERY SUPPLIES—
A. Leschen & Sons Rope Co., St. Louis, Mo.
Pelton Engineering Co., Cleveland, O.

ELECTRICAL WIRES AND CABLES—
American Steel & Wire Co., Chicago, Ill.

ELEVATING AND CONVEYING MACHINERY—
The Aultman Co., Canton, O.
American Engineering Works, Chicago, Ill.
The Brown Hoisting Machinery Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
Webster Camp & Lane Machine Co., Akron, O.

EMERY AND CORUNDUM WHEELS—
C. H. Besly & Co., Chicago, Ill.
I. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

EMERY WHEEL MACHINERY—
C. H. Besly & Co., Chicago, Ill.
J. Wendell Cole, M. E., Columbus, O., or Chicago.
Northampton Emery Wheel Co., Chicago, Ill.

ENGINEERS AND CONTRACTORS—
American Engineering Works, Chicago, Ill.
Alex. Laughlin & Co., Pittsburg, Pa.
The Best Manufacturing Co., Pittsburg, Pa.
E. E. Erickson, Pittsburg, Pa.
Garrett-Cromwell Engineering Co., Cleveland.
Jeffrey Mfg. Co., Columbus, O.
Julian Kennedy, Pittsburg, Pa.
David Lamond, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Wellman-Seaver Engineering Co., Cleveland, O
Walter Kennedy, Pittsburg, Pa.

ENGINE PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Il.
Jenkins Bros., New York City.
The Lunkenheimer Co., Cincinnati, O.
The Crane Co., Chicago, Ill.
Drake Acetylene Apparatus Co., Cleveland, O.
Wright Mfg. Co., Cleveland, O.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

ENGINES (Oil) —
The Aultman Co., Canton, O.

ENGINES (Steam)—
The Aultman Co., Canton, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
Somers, Fitler & Clarke, Pittsburg, Pa.
Wm. Tod & Co., Youngstown, O.
Vulcan Iron Works, Wilkes-Barre, Pa.
Wickes Bros., Pittsburg, Pa.

ENGRAVERS AND ELECTROTYPERS—
Rosenow & Co., Chicago, Ill.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
Wm. B. Scaife & Sons, Pittsburg, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

FELLOE PLATES—
Avery Stamping Co., Cleveland, O.

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill.

FILTER PRESSES—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

FILTERS—
Pittsburg Filter Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

FIRE BRICK AND CLAY—
Chicago Fire Brick Co., Chicago, Ill.
Clearfield Fire Brick Co., Clearfield, Pa.
Crown Fire Clay Co., Akron, O.
Dover Fire Brick Co., Cleveland, O.
John H. Ehlen, Newport, Ky.
Garden City Sand Co., Chicago, Ill.
A. J. Hawes & Son, Johnstown, Pa.
F. B. Holmes & Co., Detroit, Mich.
Kentucky Fire Brick Works, Portsmouth, O.
Keystone Fire Clay Co., Lisbon, O.
Kier Fire Brick Co., Pittsburg, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
S. Obermayer Co., Cincinnati, O., and Chicago.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
I. V. Rose & Son, Sharon, Pa.
F. B. Stevens, Detroit, Mich.
Scioto Star Fire Brick Works, Portsmouth, O.
A. F. Smith & Co., New Brighton, Pa.
Scioto Fire Brick Co., Sciotoville, O.
Union Mining Co., Mt. Savage, Md.
Webster Fire Brick Co., South Webster, O.

FIRE PROOF COVERING—
C. H. Besley & Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Jas. H. Baker Mfg. Co., Pittsburg, Pa.
Bethlehem Steel Co., South Bethlehem, Pa.
Chicago Drop Forge & Foundry Co., Kensington, Ill.
E. D. Clapp Mfg. Co., Auburn, N. Y.
Cleveland City Forge & Iron Co., Cleveland, O
Frankford Steel & Forging Co., Philadelphia.
Wyman & Gordon, Worcester, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Samuel Trethewey & Co., Pittsburg, Pa.
Geo. B. Sennett Co., Youngstown, O.
Pilling & Crane, Philadelphia, Pa.
Vulcanus Forging Co., Cleveland, O.

FOUNDRIES—
E. R. Allen, Corning, N. Y.
The Aultman Co., Canton, O.
Best Manufacturing Co., Pittsburg, Pa.
Brass Founders' Supply Co., Newark, N. J.
Hooven, Owens & Rentschler Co., Hamilton, O.
Jeffrey Mfg. Co., Columbus, O.
W. A. Jones Foundry Co., Chicago.
Link Belt Machinery Co., Chicago, Ill.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Seaman, Sleeth Co., Pittsburg, Pa.
Wm. Tod & Co., Youngstown, O.
Wheeling Mold and Foundry Co., Wheeling, W. Va.

FOUNDRY EQUIPMENT—
Jos. E. Bissell, Agt. Prentiss Tool & Supply
The W. J. Clark Co., Salem, O.
Brass Founders' Supply Co., Newark, N. J.
Cleveland Crane & Car Co., Cleveland, O.
Co., Pittsburg, Pa.
Chicago Pneumatic Tool Co., Chicago, Ill.
Macleod & Clark, Cincinnati, O.
Millett Core Oven Co., Brightwood, Mass.
Northern Engineering Works, Detroit, Mich.
S. Obermayer Co., Cincinnati, O., and Chicago.
Tabor Mfg. Co., Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.
S. Obermayer Co., Cincinnati, O., and Chicago.

FOUNDRY SUPPLIES—
Brass Founders' Supply Co., Newark, N. J.
Clearfield Fire Brick Co., Clearfield, Pa.
Cleveland Crane & Car Co., Cleveland, O.
John H. Ehlen, Newport, Ky.
Cleveland Facing Mill Co., Cleveland, O.
Chicago Fire Brick Co., Chicago, Ill.
Crown Fire Clay Co., Akron, O.
Dover Fire-Brick Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
A. J. Haws & Son, Johnstown, Pa.
F. B. Holmes & Co., Detroit, Mich.
Kentucky Fire Brick Works, Portsmouth, O.
Keystone Fire Clay Co., Lisbon, O.
Kier Fire Brick Co., Pittsburg, Pa.
Millett Core Oven Co., Brightwood, Mass.
Newport Sand Bank Co., Newport, Ky.
Northern Engineering Works, Detroit, Mich.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
S. Obermayer Co., Cincinnati, O., and Chicago.
The Ohio Sand Co., Conneaut, O.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
I. V. Rose & Son, Sharon, Pa.
Scioto Fire Brick Co., Sciotoville, O.
Somers, Fitler & Clarke, Pittsburg, Pa.
A. F. Smith & Co., New Brighton, Pa.
F. B. Stevens, Detroit, Mich.
Scioto Star Fire Brick Works, Portsmouth, O.
Tabor Mfg. Co., Philadelphia, Pa.
Union Mining Co., Mt. Savage, Md.
Vulcan Mfg. Co., Pittsburg, Pa.
Webster Fire Brick Co., South Webster, O.
Webster Foundry Sand Co., Philadelphia, Pa.

FRICTION METAL—
C. H. Besly & Co., Chicago, Ill.
Theo. Hiertz & Son, St. Louis, Mo.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FUEL OIL BURNERS—
Rockwell Engineering Co., New York City.

GAGE COCKS—
The Lunkenheimer Co., Cincinnati, O.

GALVANIZED IRON—
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington, Del.

GALVANIZERS—
American Sheet Steel Co., New York City.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

G. ENGINES—
Atlas Machine Co., Pittsburg, Pa.
Columbus Machine Co., Columbus, O.
Miller Improved Gas Engine Co., Springfield.
Northern Engineering Works, Detroit, Mich.
Somers, Fitler & Clarke, Pittsburg, Pa.

GAS PRODUCERS—
R. D. Wood & Co., Philadelphia, Pa.

GAUGES (Rolling Mill)—
Haines Gauge Co., Philadelphia, Pa.

GEARING—
James Bonar & Co., Pittsburg, Pa.
F. H. Bultman & Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
The Van Dorn & Dutton Co., Cleveland, O.
L. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.
National Gear Wheel & Foundry Co., Allegheny, Pa.
The R. D. Nuttall Co., Allegheny, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

GEAR CUTTERS—
F. H. Bultman & Co., Cleveland, O.

GEAR CUTTING—
F. H. Bultman & Co., Cleveland, O.
The Van Dorn & Dutton Co., Cleveland, O.
The R. D. Nuttall Co., Allegheny, Pa.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.
Wisconsin Graphite Co., Pittsburg, Pa.

GIRDER WORK—
Wm. B. Scaife & Sons, Pittsburg, Pa.

GRINDING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

GRAPHITE PAINT—
Wisconsin Graphite Co., Pittsburg, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos. Dixon Crucible Co., Jersey City, N. J.

HACK SAWS—
Cleveland Punch & Shear Wks. Co., Cleveland.

HANGERS—
The Aultman Co., Canton, O.
E. A. Delano, Chicago, Ill.
L. & E. Greenwald Co., Cincinnati, O.
Dodge Mfg. Co., Mishawaka, Ind.
Link Belt Machinery Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
The United Boiler Co., Girard, O.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.

HOISTS—
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HOISTING ENGINES—
The Aultman Co., Canton, O.
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
Somers, Fitler & Clarke, Pittsburg, Pa.
Torbert & Peckham, Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Webster, Camp & Lane Machine Co., Akron, O.

HOISTING MACHINERY—
The Aultman Co., Canton, O.
The Brown Hoisting Machinery Co., Cleveland, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Link-Belt Machinery Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Webster, Camp & Lane Machine Co., Akron, O.

HOISTING ROPE (Wire)—
American Steel & Wire Co., Chicago, Ill.

HOOPS (Steel)—
American Steel Hoop Co., New York City.

HORSE SHOES—
American Steel & Wire Co., Chicago, Ill.
Phoenix Horse Shoe Co., Joliet, Ill.

HYDRAULIC TOOLS—
R. D. Wood & Co., Philadelphia, Pa.

INDUSTRIAL CARS—
The Atlas Car & Mfg. Co., Cleveland, O.
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

IRON BUILDINGS—
American Bridge Co., New York City.
Illinois Steel Co., Chicago, Ill.
Wm. B. Scaife & Sons, Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.

IRON, NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
McCullough Iron Co., Wilmington, Del.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON ORES—
Drake, Bartow & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Jerome Keeley & Co., Philadelphia, Pa.
Lake Superior Consolidated Iron Mines, New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Tod, Stambaugh & Co., Cleveland, O.

IRON WORKING MACHINERY—
Atlas Machine Co., Pittsburg, Pa.

IRON WORKING TOOLS—
Armstrong Bros. Tool Co., Chicago, Ill
The Armstrong Mfg. Co., Bridgeport, Conn.
Avery Stamping Co., Cleveland, O.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Bethlehem F'dry & Mach. Co., S.Bethlehem,Pa
Bickford Drill & Tool Co., Cincinnati, O.
H. Bickford, Lakeport, N. H.
Jos. K. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
F. H. Bultman & Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Thos. P. Conard, Philadelphia, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.
C. C. Wormer Machinery Co., Detroit, Mich.

LADLES—
The W. J. Clark Co., Salem, O.
Northern Engineering Works, Detroit, Mich.
S. Obermayer Co., Cincinnati, O., and Chicago.
Wm. B. Pollock Co., Youngstown, O.
The United Boiler Co., Girard, O.

LAG SCREWS—
Vulcanus Forging Co., Cleveland, O.

LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Joseph E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.
Somers, Fitler & Clarke, Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.

LATHE TOOLS—
Armstrong Bros. Tool Co., Chicago, Ill.

LINK BELTING—
The Aultman Co., Canton, O.
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.

LOCOMOTIVES—
Hyde Bros. & Co., Pittsburg, Pa.

LUBRICANTS—
The Ironsides Co., Columbus, O.
Wisconsin Graphite Co., Pittsburg, Pa.

LUBRICATING DEVICES—
The Lunkenheimer Co., Cincinnati, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

MACHINE TOOLS—
American Engineering Works, Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Atlas Machine Co., Pittsburg, Pa.
U. Baird Machinery Co., Pittsburg, Pa.
C. H. Besly & Co., Chicago, Ill.
Bertsch & Co., Cambridge City, Ind.
Bethlehem F'dry & Mach. Co., S.Bethlehem,Pa
H. Bickford, Lakeport, N. H.
Bickford Drill & Tool Co., Cincinnati, O.
Joseph E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
F. H. Bultman & Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Curtis & Curtis Co., Bridgeport, Conn.
Danielson Machine & Tool Co., Cleveland, O.
Pelton Engineering Co., Cleveland, O.
F. B. Shuster Co., New Haven, Conn.
Somers, Fitler & Clarke, Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.
C. C. Wormer Machinery Co., Detroit, Mich.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

MACHINERY AND TOOL STEEL—
American Steel & Wire Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Crescent Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.
Byron H. White, Chicago, Ill.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.

MALLEABLE CASTINGS—
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Link Belt Machinery Co., Chicago, Ill.
Meadville Malleable Iron Co., Meadville, Pa.

MANILLA ROPE—
A. Leschen & Sons Rope Co., St. Louis, Mo.

MANILLA ROPE COATING—
The Ironsides Co., Columbus, O.

MANUFACTURING CHEMISTS—
Grasselli Chemical Co., Cleveland, O.

METAL BEARINGS—
C. H. Besly & Co., Chicago, Ill.
Theo. Hiertz & Son, St. Louis, Mo.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

METAL SAWS—
J. R. Vandyck, New York City, N. Y.

METAL WORK—
Avery Stamping Co., Cleveland, O.

MILL CASTINGS—
A. Garrison Foundry Co., Pittsburg, Pa.

MILLING MACHINES—
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MILLING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

MINING MACHINERY—
The Edward P. Allis Co., Milwaukee, Wis.
American Engineering Works, Chicago, Ill.
The Atlas Car & Mfg. Co., Cleveland, O.
C. H. Besly & Co., Chicago, Ill.
The Bucyrus Co., South Milwaukee, Wis.
Wm. Cramp & Sons, Philadelphia, Pa.
Fraser & Chalmers, Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Lidgerwood Mfg. Co., New York City.
Link Belt Machinery Co., Chicago, Ill.
Marion Steam Shovel Co., Marion, O.
Wm. B. Pollock Co., Youngstown, O.
Raymond Bros. Impact Pulverizer Co., Chicago.
Thew Automatic Shovel Co., Lorain, O.
Torbert & Peckham, Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Webster, Camp & Lane Machine Co., Akron, O.

MINE LOCOMOTIVES—
Jeffrey Manufacturing Co., Columbus, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Somers, Fitler & Clarke, Pittsburg, Pa.
Torbert & Peckham, Chicago, Ill.

MOLDING MACHINES—
S. Obermayer Co., Cincinnati, O., and Chicago.
Tabor Mfg. Co., Philadelphia, Pa.

MOLDING SAND—
John H. Ehlen, Newport, Ky.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.
S. Obermayer Co., Cincinnati, O., and Chicago.
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Webster Foundry Sand Co., Philadelphia, Pa.

MULTIPLE DRILLS—
Bickford Drill & Tool Co., Cincinnati, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS (SELF LOCKING)—
National Elastic Nut Co., Milwaukee, Wis.

NUTS AND BOLTS—
National Elastic Nut Co., Milwaukee, Wis.
Milton Manufacturing Co., Milton, Pa.
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
Rockwell Engineering Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
The Crane Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

OIL STORAGE TANKS—
Wm. B. Pollock Co., Youngstown, O.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia.

OIL TANKS AND CARS—
Wm. B. Pollock Co., Youngstown, O.

ORE BARROWS—
The Atlas Car & Mfg. Co., Cleveland, O.

ORE CARS—
The Atlas Car & Mfg. Co., Cleveland, O.
The Pressed Steel Car Co., Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.

ORE HANDLING MACHINERY—
The Atlas Car & Mfg. Co., Cleveland, O.
Jeffrey Manufacturing Co., Columbus, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

ORE TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
A. Leschen & Sons Rope Co., St. Louis, Mo.

PAINT—
Jos. Dixon Crucible Co., Jersey City, N. J.
Iron Clad Paint Co., Cleveland, O.
The Ironsides Co., Columbus, O.
Wisconsin Graphite Co., Pittsburg, Pa.

PAINT MACHINES—
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, O.

PATTERN WORKS—
Balkwill Pattern Works, Cleveland, O.
C. Birnbaum, Cleveland, Ohio.
Forsythe Pattern Works, Youngstown, O.
Gobeille Pattern Co., Cleveland, O.

PERFORATED METALS—
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

PIG IRON—
Alabama Consolidated Coal & Iron Co., Birmingham, Ala.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.
Reed F. Blair & Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Cabeen Co., Philadelphia, Pa.
Cherry Valley Iron Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Crerar Clinch & Co., Chicago, Ill.
A. M. Crane & Co., Chicago, Ill.
The Rob't Field Co., Columbus, O.
M. A. Hanna & Co., Cleveland, O.
Hickman, Williams & Co., Chicago, Ill.
J. H. Hillman & Son, Pittsburg, Pa.
Jerome Keeley & Co., Philadelphia, Pa.
McKeefrey & Co., Leetonia, O.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Pilling & Crane, Philadelphia, Pa.
Republic Iron & Steel Co., Chicago, Ill.
Sloss Sheffield Steel & Iron Co., Birmingham, Ala.
Spearman Iron Co., Sharpsville, Pa.
F. B. Stevens, Detroit, Mich.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

PIPE (CAST IRON)—
A. M. Crane & Co., Chicago, Ill.
Massillon Iron & Steel Co., Chicago, Ill.

PIPE (RIVETED STEEL)—
A. M. Crane & Co., Chicago, Ill.
Wm. B. Pollock Co., Youngstown, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn.
Somers, Fitler & Clarke, Pittsburg, Pa.

PIPE FITTERS—
The Best Manufacturing Co., Pittsburg, Pa.
Pittsburg Valve, Fdy. & Construc. Co., Pittsburg, Pa.

PISTON AIR DRILLS—
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, O.

PISTON RODS—
Bethlehem Steel Co., South Bethlehem, Pa.

PLANERS—
Atlas Machine Co., Pittsburg, Pa.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Somers, Fitler & Clarke, Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.

PLANER TOOLS—
Armstrong Bros. Tool Co., Chicago, Ill.

PLANISHED IRON—
American Sheet Steel Co., New York City.

PLATES—
American Steel & Wire Co., Chicago, Ill.
A. M. Crane & Co., Chicago, Ill.
Enterprise Boiler Co., Youngstown, O.
Illinois Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Chicago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
The Crane Co., Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.
W. J. Schaefer Co., New York City.

PNEUMATIC TOOLS—
American Engineering Works, Chicago, Ill.
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, O.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

POWER PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Bethlehem F'dry & Mach. Co., S.Bethlehem,Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Danielson Machine & Tool Co., Cleveland, O.

POWER TRANSMISSION MACHINERY—
The Aultman Co., Canton, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
I. & E. Greenwald Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Link Belt Machinery Co., Chicago, Ill.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

PRESSED STEEL CARS—
Pressed Steel Car Co., Pittsburg, Pa.

PRESSES—
Atlas Machine Co., Pittsburg, Pa.
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Bethlehem F'dry & Mach. Co., S. Bethlehem, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Danielson Machine & Tool Co., Cleveland, O.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.

PULLEYS—
The Aultman Co., Canton, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
I. & E. Greenwald Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
W. A. Jones Foundry Co., Chicago, Ill.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Link Belt Machinery Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

PULVERIZING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

PUMPS (STEAM)—
The Edward P. Allis Co., Milwaukee, Wis.
Blakeslee Mfg. Co., Du Quoin, Ill.
The Deming Co., Salem, O.
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Torbert & Peckham, Chicago, Ill.
R. D. Wood & Co., Philadelphia, Pa.

PURIFIERS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill & Tool Co., Cincinnati, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.

RAILS—
American Steel Hoop Co., New York City.
The Atlas Car & Mfg. Co., Cleveland, O.
A. M. Crane & Co., Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.
Joseph Schonthal, Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

RAILWAY SUPPLIES—
The Atlas Car & Mfg. Co., Cleveland, O.
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.
Joseph Schonthal, Pittsburg, Pa.

RECORDING GAUGES—
Somers, Fitler & Clarke, Pittsburg, Pa.

RELAYING RAILS—
A. M. Crane & Co., Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.

RIVETS—
Champion Rivet Co., Cleveland, O.
Vulcanus Forging Co., Cleveland, O.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co., Youngstown, O.

RIVETERS—
R. D. Wood & Co., Philadelphia, Pa.

RIVETING HAMMERS—
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, O.

RIVETING MACHINES—
Chicago Pneumatic Tool Co., Chicago, Ill.

RIVET MACHINES—
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

ROCK CRUSHERS—
Raymond Bros. Impact Pulverizer Co., Chicago.

ROCK DRILLS—
The Ingersoll-Sergeant Drill Co., New York.
Rand Drill Co., Chicago, Ill.

ROLL FORGINGS—
Frankford Steel & Forging Co., Philadelphia.
Samuel Trethewey & Co., Pittsburg, Pa.

ROLLING MILL MACHINERY—
Canton Roll & Machine Co., Canton, O.
Frank-Kneeland Machine Co., Pittsburg, Pa.
A. Garrison Foundry Co., Pittsburg, Pa.
Geo. B. Sennett Co., Youngstown, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
The United Boiler Co., Girard, O.
West Penn Foundry & Machine Co., Avonmore, Pa.

ROOFS—
American Bridge Co., New York City.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

ROPE AND CORDAGE—
Dodge Mfg. Co., Mishawaka, Ind.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Link Belt Machinery Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.
Waterbury Rope Co., New York City.

ROTARY BREAST DRILLS—
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, O.

SAWING AND DRILLING MACHINERY—
J. R. Vandyck, New York City, N. Y.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCRAP IRON—
A. J. Bell, Pittsburg, Pa.
A. M. Crane & Co., Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.
Illinois Steel Co., Chicago, Ill.
Joseph Schonthal, Pittsburg, Pa.

SCREENS FOR COAL, ORE, ETC.
Robt. Aitchison Perforated Metal Co., Chicago.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
F. B. Shuster Co., New Haven, Conn.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Chicago Screw Co., Chicago, Ill.
Upson Nutt Co., Cleveland, O.

SECOND-HAND MACHINERY—
American Engineering Works, Chicago, Ill.
The Atlas Machine Co., Pittsburg, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
The W. J. Carlin Co., Pittsburg, Pa.
Hyde Bros. & Co., Pittsburg, Pa.
Pelton Engineering Co., Cleveland, O.
Joseph Schonthal, Pittsburg, Pa.
Torbert & Peckham, Chicago, Ill.
C. C. Wormer Machinery Co., Detroit, Mich.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia.

SEPARATING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

SHAFTING—
American Steel & Wire Co., Chicago, Ill.
Atlas Machine Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
Bethlehem Steel Co., South Bethlehem, Pa.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
Link Belt Machinery Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Bethlehem F'dry & Mach. Co., S. Bethlehem, Pa
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Danielson Machine & Tool Co., Cleveland, O.
R. D. Wood & Co., Philadelphia, Pa.

SHAPERS—
Atlas Machine Co., Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.

SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SHEET IRON AND STEEL—
American Sheet Steel Co., New York City.
American Steel & Wire Co., Chicago, Ill.
Republic Iron & Steel Co., Chicago, Ill.

SHEET METAL WORK—
The W. J. Clark Co. Salem, O.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SOLID STEEL SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SPECIAL MACHINERY—
The Aultman Co., Canton, O.
Avery Stamping Co., Cleveland, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Danielson Machine & Tool Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Wheeling Mold & F'ndry Co., Wheeling, W. Va.

STACKS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.
The United Boiler Co., Girard, O.

STEAM AND GAS FITTERS' TOOLS—
The Crane Co., Chicago, Ill.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

STEAM HAMMERS—
American Engineering Works, Chicago, Ill.

STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co., Chicago, Ill.

STEAM PACKING—
C. H. Besly & Co., Chicago, Ill.

STEAM PUMPS—
Edw. P. Allis Co., Milwaukee, Wis.
Blakeslee Mfg. Co., Du Quoin, Ill.
The Deming Co., Salem, O.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Torbert & Peckham, Chicago, Ill.
R. D. Wood & Co., Philadelphia, Pa.

STEAM SEPARATORS—
Harrison Safety Boiler Works, Philadelphia.
Wright Manufacturing Co., Cleveland, O.

STEAM SHOVELS AND DREDGES—
The Bucyrus, Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
The Thew Automatic Shovel Co., Lorain, O.
Torbert & Peckham, Chicago, Ill.

STEAM SPECIALTIES—
C. H. Besly & Co., Chicago, Ill.
The Crane Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O

STEEL—
American Steel Hoop Co., New York City.
American Steel & Wire Co., Chicago, Ill.
Cabeen Co., Philadelphia, Pa.
Champion Iron & Steel Co., Muskegon, Mich.
A. M. Crane & Co., Chicago, Ill.
Crescent Steel Co., Pittsburg, Pa.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
Otis Steel Co., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

STEEL BANDS—
American Steel Hoop Co., New York City.
American Steel & Wire Co., Chicago, Ill.

STEEL BLOOMS AND BILLETS—
American Steel Hoop Co., New York City.
American Steel & Wire Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.
Cabeen Co., Philadelphia, Pa.
Champion Iron & Steel Co., Muskegon, Mich.
A. M. Crane & Co., Chicago, Ill.
Jerome Keeley & Co., Philadelphia, Pa.
The Lorain Steel Co., Lorain, O.
National Steel Co., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

STEEL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

STEEL CASTINGS—
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Bethlehem Steel Co., South Bethlehem, Pa.
Otis Steel Co., Cleveland, O.
The Sargent Co., Chicago, Ill.

STEEL CEILINGS—
Berger Manufacturing Co., Canton, O.

STEEL FRAME MILL BUILDINGS—
American Bridge Co., New York City.
Pittsburg Steel Construction Co., Pittsburg, Pa
Wm. B. Scaife & Sons, Pittsburg, Pa.

STEEL HOOPS—
American Steel Hoop Co., New York City.

STEEL PLANTS—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

STEEL SHEETS—
American Sheet Steel Co., New York City.
American Steel & Wire Co., Chicago, Ill.
Republic Iron & Steel Co., Chicago, Ill.

STEEL STAMPS—
F. A. Sackmann, Cleveland, O.

STENCILS—
F. A. Sackmann, Cleveland, O.

STOCKS AND DIES—
The Crane Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

TANKS—
The Aultman Co., Canton, O.
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, O.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.
The United Boiler Co., Girard, O.

TANK CARS—
Wm. B. Pollock Co., Youngstown, O.

TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa

TIN AND TERNE PLATES—
American Tin Plate Company, New York City.
Champion Iron & Steel Co., Muskegon, Mich.

TIN PLATE MACHINERY—
Canton Roll & Machine Co., Canton, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
West Penn Foundry & Machine Co., Avonmore, Pa.

TOOL HOLDERS—
Armstrong Bros. Tool Co., Chicago, Ill.

TOOL STEEL—
American Steel & Wire Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Crescent Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

TORCHES—
Somers, Fitler & Clarke, Pittsburg, Pa.

TRAMWAYS—
The Atlas Car & Mfg. Co., Cleveland, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.

TRANSMISSION MACHINERY—
The Aultman Co., Canton, O.
The Brown Hoisting Machinery Co., Cleveland, O.
Dodge Mfg. Co., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
W. A. Jones Foundry & Machine Co., Chicago.
Link Belt Machinery Co., Chicago, Ill.

TRANSMISSION ROPE (WIRE)—
American Steel & Wire Co., Chicago, Ill.

TROLLEY TRACKS—
The Atlas Car & Mfg. Co., Cleveland, O.
Northern Engineering Works, Detroit, Mich.

TROLLEY WIRES—
American Steel & Wire Co., Chicago, Ill.

TRUCKS—
The Atlas Car & Mfg. Co., Cleveland, O.
Northern Engineering Works, Detroit, Mich.
Pressed Steel Car Co., Pittsburg, Pa.

TUBES—
S. Fix' Sons, Cleveland, O.
National Tube Co., Pittsburg, Pa.

TUBE WELDING—
S. Fix' Sons, Cleveland, O.

TUMBLERS—
Northern Engineering Works, Detroit, Mich.

TURBINE WATER WHEELS—
Stilwell-Bierce & Smith Vaile Co., Dayton, O.

TURNBUCKLES—
Ceveland City Forge & Iron Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

TWIST DRILLS—
C. H. Besly & Co., Chicago, Ill.

TWIST DRILL CASES—
Somers, Fitler & Clarke, Pittsburg, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

VALVES—
C. H. Besly & Co., Chicago, Ill.
The Best Manufacturing Co., Pittsburg, Pa.
The Crane Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.
Jenkins Bros., New York City.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

WASHERS—
Avery Stamping Co., Cleveland, O.
Milton Manufacturing Co., Milton, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

WATER COLUMNS—
Somers, Fitler & Clarke, Pittsburg, Pa.

WATER PIPE—
Massillon Iron & Steel Co., Chicago, Ill.

WATER SOFTENING PLANTS—
Pittsburg Filter Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

WIRE—
American Steel & Wire Co., Chicago, Ill.
Summit Wire Co., Cuyahoga Falls, O.

WIRE COATING—
The Ironsides Company, Columbus, O.

WIRE FENCING—
American Steel & Wire Co., Chicago, Ill.

WIRE FILLER—
The Ironsides Co., Columbus, O.

WIRE GOODS—
F. B. Shuster Co., New Haven, Conn.

WIRE MACHINERY—
S. W Goodyear, Waterbury, Conn.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS—
American Steel & Wire Co., Chicago, Ill.

WIRE ROPE—
American Steel & Wire Co., Chicago, Ill
A. Leschen & Sons Rope Co., St. Louis, Mo.
Somers, Fitler & Clarke, Pittsburg, Pa.
Waterbury Rope Co., New York City.

WIRE ROPE COATING—
The Ironsides Company, Columbus, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

WIRE ROPE FILLING—
The Ironsides Co., Columbus, O.

WOOD PULLEYS—
Dodge Mfg. Co., Mishawaka, Ind.
Somers, Fitler & Clarke, Pittsburg, Pa.

WROUGHT PIPE—
The Crane Co., Chicago, Ill.
National Tube Co., Pittsburg, Pa.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

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United Boiler Co	39
United States Telephone Co	2
Upson Nut Co	1
Van Dorn & Dutton Co	33
Vandyck, J. R	28
*Vulcan Iron Works	37
Vulcan Mfg. Co	34
*Vulcanus Forging Co	35
Waterbury Farrel Foundry & Machine Co	53
Waterbury Rope Co	39
Webster, Camp & Lane Machine Co	26
Webster Fire Brick Co	1
Webster Foundry Sand Co	45
Wellman-Seaver Engineering Co	39
West Penn Foundry & Machine Co	41
Wheeling Mold & Foundry Co	60
White, Byron H	34
Wisconsin Graphite Co	31
Wood & Co., R. D	28
Wormer Machinery Co., C. C	52
Wright Manufacturing Co	26
Wyman & Gordon	59